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DEPARTMENT OF AGRICULTURE.

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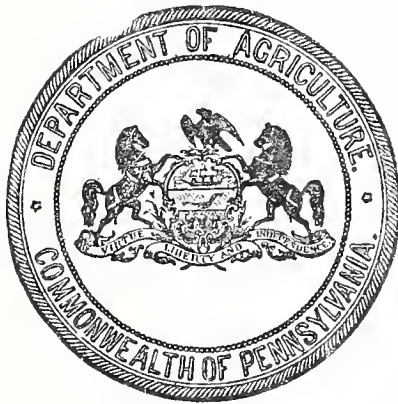
PROCEEDINGS

OF THE

THIRTIETH ANNUAL MEETING

OF THE

Pennsylvania State Board of Agriculture.



HELD IN THE

OLD EXECUTIVE BUILDING, HARRISBURG, PA.

JANUARY 22 and 23, 1907.

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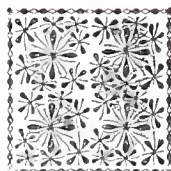
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MEMBERS

OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE,

FOR THE YEAR 1907.

Members Ex-Officio.

HON. EDWIN S. STUART, Governor.
 HON. HENRY HOUCK, Secretary of Internal Affairs.
 DR. N. C. SCHAEFFER, Superintendent of Public Instruction.
 President of the State College.
 HON. ROBERT K. YOUNG, Auditor General.
 HON. N. B. CRITCHFIELD, Secretary of Agriculture.

Appointed by the Governor.

Gen. James A. Beaver, Centre County,Term expires 1907
 R. I. Young, Middletown, Dauphin County,Term expires 1908
 Col. R. H. Thomas, Mechanicsburg, Cumberland County,Term expires 1909

Appointed by the State Poultry Association.

J. D. Nevius, Philadelphia,1910

Elected by County Agricultural Societies.

	Term expires.
Adams, A. I. Weidner,	Arendtsville, .....1909
Allegheny, J. S. Burns,	Imperial, R. F. D. No. 1, ..1909
Armstrong, S. S. Blyholder,	Neale, .....1908
Beaver, A. L. McKibben,	New Sheffield, .....1908
Bedford, W. C. Lutz,	Bedford, .....1909
Berks, H. G. McGowan,	Geiger's Mills, .....1910
Blair, F. Jaekel,	1013 10th St., Altoona, .....1907
Bradford, E. E. Chubbuck,	Rome, R. F. D. No. 16, .....1910
Bucks, .....	.....
Butler, .....	.....
Cambria, H. M. Gooderham,	Patton, R. F. D., .....1910
Cameron, .....	.....
Carbon, .....	.....
Centre, John A. Woodward, ..	Howard, .....1909
Chester, M. E. Conard,	Westgrove, .....1909
Clarion, S. X. McClellan,	Knox, .....1910
Clearfield, E. M. Davis,	Grampian, .....1910
Clinton, J. A. Herr,	Millhall, R. F. D., .....1908
Columbia, A. P. Young,	Millville, .....1909

Term expires.

Crawford,	J. F. Seavy,	Saegerstown,	1908
Cumberland,	Chas. H. Mullin,	Mt. Holly Springs,	1909
Dauphin, .....	.....	.....	.....
Delaware,	R. M. Heyburn,	Ward,	1908
Elk,	John M. Witman,	St. Mary's,	1908
Erie,	S. D. West,	Wattsburg,	1907
Fayette, .....	.....	.....	.....
Forest,	C. A. Randall,	Tionesta,	1907
Franklin,	C. B. Hege,	Marion,	1908
Fulton,	J. L. Patterson,	McConnellsburg,	1910
Greene,	N. M. Biddle,	Carmichaels,	1910
Huntingdon,	Geo. G. Hutchison,	Warrior's Mark,	1909
Indiana,	S. M. McHenry,	Indiana,	1910
Jefferson,	Peter B. Cowan,	Brookville,	1910
Juniata,	Matthew Rodgers,	Mexico,	1909
Lackawanna,	Horace Seamans,	Factoryville,	1910
Lancaster,	W. H. Brosius,	Fernglen,	1910
Lawrence,	Sam'l McCreary,	Volant,	1909
Lebanon,	H. C. Snavely,	Cleona,	1910
Lehigh,	P. S. Fenstermaker, ..	Allentown,	1909
Luzerne,	J. H. Snyder,	Truckville,	1907
Lycoming,	A. J. Kahler,	Hughesville,	1909
McKean, .....	.....	.....	.....
Mercer,	W. C. Black,	Mercer,	1908
Mifflin,	M. M. Naginey,	Milroy,	1910
Monroe,	R. F. Schwarz,	Analomink,	1908
Montgomery,	J. Sexton,	North Wales,	1908
Montour, .....	.....	.....	.....
Northampton,	W. F. Beck,	Easton, R. F. D.,	1909
Northumberland,	I. A. Eschbach,	Milton, R. F. D.,	1908
Perry,	A. T. Holman,	Millerstown,	1910
Philadelphia,	Edwin Lonsdale,	Girard College, Phila.,	1910
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Potter,	H. H. Hall,	Ellisburg,	1909
Schuylkill,	W. H. Stout,	Pinegrove,	1910
Snyder,	J. F. Boyer,	Freeburg,	1909
Somerset,	Jacob S. Miller,	Friedens,	1908
Sullivan,	E. R. Warburton,	Dushore, R. F. D. No. 3, ..	1908
Susquehanna,	Frank A. Davies,	Montrose,	1910
Tioga,	F. E. Field,	No. 209 Caldwell Ave., El-	
Union,	J. Newton Glover,	mira, N. Y.,	1908
Venango, .....	.....	Vicksburg,	1908
Warren,	R. J. Weld,	Sugargrove,	1908
Washington,	D. S. Taylor,	Raccoon,	1908
Wayne,	Warren E. Perham, ..	Niagara,	1910
Westmoreland,	M. N. Clark,	Claridge,	1910
Wyoming,	D. A. Knuppenburg, ..	Lake Carey,	1910
York,	G. F. Barnes,	Rossville,	1908

OFFICERS.

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Hon. Edwin S. Stuart, Governor, Harrisburg.

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J. A. Herr, Millhall.
E. E. Chubbuck, Rome.
S. X. McClellan, Knox.

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H. C. Snavely,	Cleona.
S. S. Blyholder,	Neale.
I. A. Eschbach,	Milton.
W. H. Stout,	Pinegrove.
M. N. Clark,	Claridge.
M. M. Naginey,	Milroy.
H. G. McGowan,	Geiger's Mills.
Horace Seamans,	Factoryville.
N. B. Critchfield, <i>Secretary</i> ,	Harrisburg.

ADVISORY COMMITTEE.

N. B. Critchfield, <i>Secretary</i> ,	Harrisburg.
M. N. Clark,	Claridge.
H. C. Snively,	Cleona.
I. A. Eschbach,	Milton.

CONSULTING SPECIALISTS.

Botanist,	Prof. W. A. Buckout,	State College.
Pomologist,	Dr. J. H. Funk,	Boyertown.
Chemist,	Dr. William Frear,	State College.
Vet. Surgeon,	Dr. Leonard Pearson,	Philadelphia.
Sanitarian,	Dr. Edward Patrick,	West Chester.
Microscopists and Hygienists,	Prof. C. B. Cochran,	West Chester.
	Dr. Geo. G. Groff,	Lewisburg.
Entomologists,	Prof. H. A. Surface,	Harrisburg.
	Prof. Franklin Menges,	York.
Ornithologist,	Prof. H. A. Surface,	Harrisburg.
Meteorologists,	E. R. Demain,	Harrisburg.
	J. L. Heacock,	Quakertown.
Mineralogist,		
Apiarist,	Prof. Geo. C. Butz,	State College.
Geologists,	J. A. Harvey,	Lock Haven.
	W. H. Stout,	Pinegrove.

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LEGISLATION.

Hon. A. J. Kahler, Chairman,Hughesville.
 Hon. Jason Sexton,North Wales.
 Hon. H. G. McGowan,Geiger's Mills.
 Matthew Rodgers,Mexico.
 S. S. Blyholder,Neale.

CEREALS AND CEREAL CROPS.

A. P. Young, Chairman,Millville.

ROADS AND ROAD LAWS.

D. A. Knuppenburg, Chairman,Lake Carey.

FRUIT AND FRUIT CULTURE.

John F. Boyer, Chairman,Freeburg.

DAIRY AND DAIRY PRODUCTS.

R. J. Weld, Chairman,Sugargrove.

FERTILIZERS.

R. F. Schwarz, Chairman,Analomink.

WOOL AND TEXTILE FIBRES.

D. S. Taylor, Chairman,Raccoon.

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Dr. E. E. Tower, Chairman,Hop Bottom.

POULTRY.

Dr. M. E. Conard, Chairman,Westgrove.

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James M. Piatt, Chairman,Tunkhannock.

APIARY.

J. W. Nelson, Chairman,Shawville.

FLORICULTURE.

Edwin Lonsdale, Chairman,Girard College, Phila.

FEEDING STUFFS.

G. G. Hutchison, Chairman,Warrior's Mark.

PROCEEDINGS OF THE THIRTIETH ANNUAL
MEETING OF THE STATE BOARD OF AGRICULTURE,
HELD IN OLD EXECUTIVE BUILDING, HARRISBURG, PA., JANUARY 22 AND 23,
1907.

Harrisburg, Pa., Tuesday, January 22, 1907, 9 A. M.

Vice President A. J. Kahler in the Chair.

The CHAIRMAN: The hour has arrived for the opening of the Thirtieth Annual Convention of the State Board of Agriculture. The meeting will, therefore, please come to order, and we will proceed with the program. First in order, I believe, is roll-call. Will the Secretary please call the roll?

A Member: In calling the roll, I think it would be well to take note of the members whose terms expire this year.

The SECRETARY: The distinction will be made.

The roll of members was called by the Secretary, and at this first roll-call and a subsequent call, the following persons answered to their names, a quorum being present at first roll-call; the names of those present whose terms expire in 1907 being recorded in italics:

Gen. James A. Beaver, R. I. Young, J. S. Burns, S. S. Blyholder, W. K. Lutz (succeeding S. S. Diehl, whose term expired in 1906). *H. G. McGowan*, *E. E. Chubbuck*, John A. Woodward, M. E. Conard, *S. X. McClellan*, *J. W. Nelson*, J. A. Herr, A. P. Young, J. F. Seavy, John M. Witman, Geo. G. Hutchison, *S. M. McHenry*, Matthew Rodgers, *Horace Seamans*, Samuel McCreary, *H. C. Snively*, P. S. Fenstermaker, *J. H. Snyder*, A. J. Kahler, *M. M. Naginey*, R. F. Schwarz, J. Sexton, W. F. Beck, I. A. Eschbach, *A. T. Holman*, H. H. Hall, W. H. Stout, J. F. Boyer, E. R. Warburton, *E. E. Tower*, J. Newton Glover, *August Morck*, R. J. Weld, D. S. Taylor, *Warren E. Perham*, *M. N. Clark*, *D. A. Knuppenburg*, G. F. Barnes.

Ex-officio members present were Hon. Edwin S. Stuart, Governor, and N. B. Critchfield, Secretary of Agriculture.

The following consulting specialists were present: Dr. J. H. Funk, Pomologist; Dr. William Frear, Chemist; Dr. Leonard Pearson, Veterinary Surgeon; Prof. H. A. Surface, Entomologist and Ornithologist; Col. Henry C. Demming, Mineralogist and Geologist, and W. H. Stout, Geologist.

The CHAIRMAN: The next thing on the program is the reading of the minutes of the last meeting; will the Secretary please read them?

Minutes of the last meeting were read by the Secretary, which, on motion, were approved.

The CHAIRMAN: Next in order is the appointment of the Committee on Credentials. I will name on that committee, Messrs. Herr, of Clinton; Blyholder, of Armstrong; Schwarz, of Monroe; Glover, of Union, and McCreary, of Lawrence. They will please examine the credentials of the members, and report to us later in the day.

The CHAIRMAN: We are now ready to receive the reports of Specialists and Standing Committees. The first in order, is the report of Prof. Buckhout, Botanist; is he in the room?

The SECRETARY: Prof. Buckhout is not present in person; but I wish to say that I have his report. It is for you to say what shall be done with it—whether it shall be received, and read, or placed on file to be published with the proceedings of this meeting.

A Member: I move that this report be received and placed on file.

The motion being seconded, it was agreed to.

The report is as follows:

REPORT OF THE BOTANIST.

BY PROF. W. A. BUCKHOUT, *State College, Pa.*

My intercourse with the farmers of the State and with the State Board of Agriculture has become scarcely more than that of a correspondent in answer to inquiries upon matters of practice more or less closely related to Botany. It is thus but little, if at all, separated from Horticulture. Moreover, the subjects of inquiry are for the most part simple and quite similar from year to year.

But, in accordance with custom, I may say that the chief inquiries have been plants sent in for identification. None of these have been out of the ordinary, and none presented any marked peculiarities. They were mostly weeds, and sent as such, with the request that some efficient method of eradication was desired.

It is unnecessary, and would be unprofitable, to take your time and mine in repeating the few simple points respecting weed destruction; the more so, since so many persons would still be unconvinced as to their practicability, and unsatisfied to find that there are no short and cheap methods which will help them out of a difficulty, generally of their own making, or their own sufferance.

Popular interest has been excited by accounts of the destruction of the minor water-growths by copper sulphate, with the consequent purification of the water; and some have raised the query whether the same treatment will not remove the more evident and bulky water weeds, such as eel-grass, water cress, etc. In reply it should be said that different kinds of plants are differently affected by copper sulphate treatment, and hence no general direction can be given which will fit every case. Rather must each case be specially

considered by itself. In many instances it may be noted that this method is quite out of the question on account of the expense or the danger involved.

There is still a good deal of popular interest in artificially growing medicinal plants; it is kept alive by the seductive advertising of interested parties who have roots and seeds to sell. The intending grower will avoid disappointment and loss if he will give careful attention to the conditions found necessary in the growth of such plants, and the essential differences between them and the ordinary plants of cultivation, which latter have become truly domesticated, and thus are essentially different from their wild prototypes. An acre of corn or potatoes is one thing, and an acre of ginseng or golden seal is a vastly different thing. There is no proper parallel between them beyond the fact that each occupies an acre of land. So carefully and impartially have these matters been considered by the United States Department of Agriculture that the best advice which can be given any inquirer is to write there for bulletins upon the subject. The series of Farmers' Bulletins which are sent gratuitously upon application, cover most of these subjects; and it is surprising how few farmers seem to know of them, or have the disposition to obtain and read them.

The transplanting of large trees is a matter of occasional interest and inquiry. It is no doubt sometimes entirely feasible and desirable to transplant large specimens of some particularly valuable kind, or, in order to produce some specific effect quickly. But, when one is confronted with this problem he will do well to make haste slowly and count the cost and try to forecast the results before he turns a shovelful of earth. There is no doubt but that it can be done and that the conditions which should control the process are quite well known, but the cost is often prohibitive and the results unsatisfactory. It is best to do it in the winter time, digging a wide trench around the base of the tree, as far away from it as the conditions will permit. Allow the large mass thus isolated to freeze, jack it up, and if the distance of removal is considerable, or there are obstacles in the way of carriage while upright, throw the tree prostrate in such a way as to bring the base squarely upon a sled or drag of some kind. The top should be liberally thinned out, in some cases the branches shortened in, and all parts to which chains or ropes are attached protected by flat slats and matting. When the ground is covered with snow or ice even a very large tree can be transplanted with great ease and placed in the desired position. The earth should be carefully packed in about the roots as soon as frost is out of the ground, and the trunk stayed with guy ropes or wires for a year or two unless it should appear to be more than ordinarily stable. A moment's thought will show the great advantage of winter removal and the greater success which it promises. It is no unusual thing, however, for the work to be done at other times of the year. But the expense is far beyond the means of most men. It requires special implements and devices to handle the great weight and awkward bulk, while the chances of satisfactory growth are not large in spite of the extravagant claims and exaggerated stories which interested parties may make.

Various cases of plant disease came to my notice, but few of which were of such a nature that material help could be given to the

case in hand. This is a common experience, since far more is to be expected from prevention than from attempts at cure. When blight, mildew, rust and the like have once gotten a foothold on plants, it is generally too late to save those particular plants, but the knowledge gained in the examination of the case should point out some way of preventing or avoiding future difficulty.

A case of ergotism, similar to that recorded in your Report of 1902, Part 1, Page 160, was specially noteworthy. In a stable having a number of horses, several of the animals became sick for no apparent reason. When a veterinarian was called in he pronounced the disease ergotism, and suspicion at once pointed to the hay as the cause. Samples of this hay sent to me were found to contain considerable ergotted grains in the red-top which made up the bulk of the mass. The grains were quite small and on that account could be easily overlooked. When rye, or any of the rye grasses are affected the grains are one-half to two-thirds of an inch long, thickened, also, and curved. These features, together with the black color, make them quite conspicuous. The relatively small size and perhaps small quantity of the ergot in this case led to but partial poisoning and made possible the prevention of fatal effects.

The work of the veterinarian and the work of the botanist may thus join hand in hand for the remedying of sickness and the prevention of injury to the life of our domestic animals. Such cases of poisoning, apparently not very common in Pennsylvania, are very frequent in some sections of the country, intensified, perhaps, by the crude methods of feeding and caring for stock. It would, however, not be surprising any day to meet with cases of poisoning of horses by feeding upon a poor quality of hay containing scouring rushes or horse-tails or upon the leaves or seeds of certain plants, when they are taken just at that degree of drying which has developed the poisonous hydrocyanic acid. Such cases have been known, but fortunately, are not very common.

In conclusion, I wish to repeat that the Botanical Department of the State College will be glad to continue to examine and make report upon the various matters concerning plants which our constituents may care to send us.

The CHAIRMAN: Dr. Funk is next on the program; is he in the room?

It appeared that Dr. Funk was not present at the time.

The CHAIRMAN: Since the Doctor is not present, we will take the next number, Report of the Committee on Fruit and Fruit Culture, by Mr. J. F. Boyer, Chairman; is he here?

Mr. Boyer was reported as not being present.

The CHAIRMAN: Is Dr. Tower, Chairman of the Committee on Livestock here? If he is, we will listen to his report, that being the next on the program.

Dr. Tower, being present, read his report, as follows:

REPORT OF THE COMMITTEE ON LIVESTOCK.

BY DR. E. E. TOWER, *Chairman.*

The number of domestic animals in the United States is estimated at 200,000,000, of which Pennsylvania has 3,335,319. Of this number there are 607,506 horses, 33,532 mules, 1,086,734 cows, 774,496 other cattle, 895,982 sheep and 98,008 hogs, the total valuation of which is estimated at \$116,464,168. It is estimated by good authority that these figures have been increased by about 10 per cent. during the last year.

Pennsylvania has 224,248 farms, which, according to the above figures, gives an average of about fifteen animals to each farm. While it is true that some of our farmers are striving to breed better stock, it is also true that a large per cent. of the stock thus bred are being sold to other states, and for which the farmer is getting good prices. Farmers are giving too much attention to the production of milk, and not enough to breeding, with the idea of improving their stock.

It is estimated that Pennsylvania imports about 15,000 dairy cows a year, mostly from New York and Ohio. This should not be; we can raise just as good dairy cows as either of these states; why not do it and save \$600,000?

The demand for good horses is continually increasing, and Pennsylvania should take some step toward breeding and raising more good horses. Nearly all of the larger type of draft horses are brought in from the West and sold at from \$200 to \$300, while the Pennsylvania breeder stands by and says—"I wish we could raise such horses here." Facts and figures go to prove that we can do anything that any one else can do.

The first thing to do in our State is to get the right kind of stock to breed from. One great setback to this business has come from the experience of several stock companies in different parts of the State, who united by neighborhoods and bought stallions at the enormous price of from three to four thousand dollars each, from some individual or firm who gave some influential man a two hundred dollar share for selling the balance of the stock. In every case of this kind, as far as I can learn, the stallions have been complete failures.

In one case which came under my own observation, a stallion, said to be an imported Clydesdale, weighing about 1,500 pounds, was bought by a stock company consisting of about fifteen men, for the sum of \$3,500. The leading man in the company received a \$500 share for selling the rest of the stock. This stallion was bred to fifty-four mares and got four colts, one of which was never able to stand alone. In the late fall, the stallion died a very mysterious death, and no investigation was made. This matter has been talked over in our meetings, and some good ideas advanced as to the matter

of obtaining some good, reliable stock to breed from, but the subject has been dropped, and we are at the same point we were five years ago. I hope this interest may be renewed, and a committee appointed to investigate and formulate a plan whereby we may be able to get some new blood of the right kind, and not depend on any other state for our good horses.

The breeding and raising of mules is another branch which could be taken up and a handsome profit derived from it. At the present time a good mule will bring from \$175 to \$200, and are very scarce at that price. A good Jack that will stand from 14 to 16 hands high, and weigh from eleven to twelve hundred pounds can be bought at from \$300 to \$500, and if bred to rangy mares the offspring will find a ready sale at from \$50 to \$100 each, at four months old. The expense of raising mules is small in comparison to that of horses, and the risk so far as blemishes and unsoundness is concerned, is less than one-half. The field is open to this line of breeding, and a fortune awaits the man who will take it up.

The sheep industry is not in a very prosperous condition, and will not be, as long as farmers and others continue to keep from two to four or five dogs that are allowed to go where they choose, at any time of day or night. More stringent laws should be placed on dogs, which would not only aid in restoring the sheep industry, but have a strong tendency to decrease the loss of live and prosperity of rabies.

For lack of statistics it is impossible to give an accurate estimate of the meat-producing animals of Pennsylvania, but from the report of Secretary Wilson, we glean the following, which covers the United States, and of which Pennsylvania is a part:

In the last census year, 1900, 93,562,000 animals were slaughtered and imported.

The national consumption was 16,753,295,000 pounds. This may be better understood if these figures are reduced to the average of the census family, which is 4.6 persons. To such a family, in 1900, the farmers supplied 49 pounds veal, 431 pounds beef, 30 pounds lamb, 39 pounds mutton and 465 pounds of pork, including lard, or in all, 1,014 pounds. Every time the clock ticks a second during ten hours of a work day, the farmer drives nine animals to the butcher.

Meat products are continually advancing. In 1900 the average price of meat per pound was 12½c., and has increased until now it will average 14c. per pound. An increase of one cent a pound costs this nation \$167,533,000.

The CHAIRMAN: Since Dr. Funk has come in now, we will listen to the report of the Pomologist.

Dr. Funk's report is as follows:

THE POMOLOGIST'S REPORT.

BY DR. J. H. FUNK, *Boyetown.*

It is with diffidence that I stand before this honorable body of God's Husbandry to-day as a representative of a suppressed, oppressed and bug-ridden sister industry, which was brought about by woman's indiscretion and man's weakness. Prior to the fall of the sovereignty of Adam, Horticulture occupied the position of honor as the highest and most honorable calling of man. But since that epoch, when beautiful Eve did, with her sweet smiles and seductive manners, beguile poor Adam, and he was driven from his primitive home to dig and grub for sordid wealth, and the necessities for his existence, it has become a nip-and-tack existence. Agriculture requires so much grubbing, that horticultural products were classed among the luxuries; and even to the present time, some people look upon fruit as an article that can be dispensed with. But in most of the large cities and towns, as well as country districts, fruit has become as staple as wheat or any other products from the farm. And when choice fruit is placed upon the market, even in years of plenty, as has been the past one, the demand is good and remunerative and prices are well maintained. The crop of apples the past season was estimated at 36,120,000 barrels, or 12,625,000 barrels more than the crop of 1905. This means one-third more apples, or, in other words, just one bushel of apples for every man, woman and child in the United States—perhaps one-half the population are non-consumers. But that would again be off-set by the great waste throughout the producing districts, from neglect of gathering and handling at the proper time. From this source alone it is estimated there is one-fourth of the crop lost. Another source of great loss is poor car service and means of transportation, as well as scarcity and high price of barrels and other packages. The past season there were hundreds of carloads of apples shipped in bulk. These arriving at destination in poor condition, brought proportionately low prices, but choice fruit, put up in new, clean, packages, brought and are bringing prices but little lower than in other years when fruit was scarce.

There seems to be a certain equilibrium in nature—the more plentiful the fruit, the lower the price; the lower the price, the greater the consumption; the greater the consumption, the greater the demand; the greater the demand, the higher the price. When the maximum is reached, except in years of great scarcity, supply and demand bring about that happy medium that satisfies both producer and consumer.

A glut is brought about by large quantities of inferior goods being dumped upon the market. Choice or fancy goods always command the choice or fancy prices. Cream rises to the surface; skim-milk is sold as a cheap by-product. Therefore raise cream, and leave

the other fellow worry about the prices; be a producer of what the people want; produce something above the ordinary, either out of season or of superior quality.

Have you ever given a thought to the regularity with which things are governed? Year after year, age after age, how spring, summer, autumn and winter follow each other with slight variations; and how man's action and impulses are in the same order through all the seasons. Even the boys and girls follow the season, as though by printed program. At present they are engaged with their sleds and their skates, but soon, when the last snow disappears, before the ground is scarce dry, the girls will be merrily engaged with their hoops and ropes, and the boys with their marbles and tops. These pleasant occupations engage them for a short time, but at the approach of the March winds, they are laid aside until the following season, and in their place you will see in the school yards and farms and village streets, groups of boys with kites of every description, from two cross-sticks covered with newspaper and a few rags for a tail, to the fancy kites of varied hues, made in imitation of birds and butterflies, from the crude to the artistic, and, do you know, a wonderful lesson can be learned by watching this kite flying? It reminds us of human beings. How some scarce rise above the surface; others soar aloft, then lurch and pitch, and eventually fall, often bringing others with them in their down-fall; others, again, rise steadily to great altitude and maintain their exalted positions. The next in order will be swimming, and ball playing, etc. Thus it has been in the past, is at present, and will be to the end of time. We do not change much; Nature is a pretty steady old machine, and it is good for the majority it is so. We have become so familiar with Nature's program; it tells us when to plow, when to sow and harvest, when to plant the tree, when to prune. At the proper season, the sap begins to flow, the buds to swell, some to burst forth into luxuriant green foliage, others into beautiful bloom, with petals of varied hues, to be later developed into the ruddy-cheeked apples, blushing pears, the juicy peach or crimson berry. We often wonder at the regularity of her ripening seasons; the many transformations that are taking place around us.

Who orders these things? Not man; no; he cannot order or change the seasons; he cannot bring rain, or prevent frosts. Yet man is not helpless. He can so closely attach himself as to become a partner of Nature, working in harmony with her. He can by proper culture at the right time retain the surplus waters she has so lavishly spread over the earth by snows and rain during the season when vegetation was taking its long rest, and use it to his advantage, giving it to the growing plants during periods of drought. He can also, by proper culture at the right time, by proper fertilizers and pruning, grow and ripen the wood, and store up so much vitality in wood and buds, as to render them immune to ordinary freezes. He can by these means, and by properly thinning his fruit, produce annual crops of fruit, so who can say, that man, if he but observes Nature's laws, cannot, to a certain extent, control the growth of his crops?

The apple crop, the past season, was one rather above the average in quality, where sprayed; but where unsprayed, much of the fruit was badly infested with codling moth, fungus spots, and with San

José Scale. Many trees have borne their last crop, and thousands more are in their death agonies. In a very few years, unless the farmer awakens to his duties, the orchards that existed upon every farm and added so much to their attractiveness, as well as to the pleasures of farm life, will be a thing of the past, and the farmer will become a patron of the specialist who attends to the wants of his trees, and his condition will be more deplorable than that of the city man. After losing our possessions, we first realize their value. When the farmer's children beg for fruit, and he has none to give, then will he first see his folly and short-sightedness.

THE PEAR CROP

Was below the average, except the Kieffer's, which were very plentiful. There was so little demand for these inferior pears, that thousands of bushels were left to rot, and thousands more sold so low that they scarce paid for the handling. The only remedy lies in better culture, close thinning and pruning, and an abundance of the proper fertilizers. I think the Kieffer is planted rather more extensively than it should be, and the finer varieties, like the Bartlett, the Seckel, the Anjou, etc., are too much neglected. Prices for these finer varieties are steadily rising, owing to lack of supply.

PEACH.

The crop was far below the average in quality and quantity in most of the peach districts. Some orchards in the eastern and south eastern counties of the State had very heavy crops of extra quality, which brought very high prices, prices with me, the past season, running from one dollar to three dollars, per half-bushel basket. The manila or brown rot was very bad in some orchards, especially with early varieties. In some instances, fully half the crop was destroyed. With me the loss was very light, scarcely noticeable. I believe the spraying with the lime and sulphur is a great factor in preventing rot, by killing all spores while dormant, through winter and early spring. It is also a specific for the peach leaf curl and other fungus diseases. To be successful with peaches, none but hardy types must be planted, pruned to low-spreading, open-headed trees, that they get the full benefit of air and sunshine.

PLUMS.

Crop very light and poor in quality. The Japan varieties are proving very unsatisfactory, owing to some natural weakness of the tree, being very subject to the yellows, and other fungus diseases.

CHERRIES.

Crop was a full one of good quality, and prices were very good, considering the heavy crop. The sweet varieties should be more extensively planted, budded on Mazzard stock. The demand is rapidly increasing for choice sweet cherries.

All other fruit crops, including the berries, have been good and profitable this year. And the general fruit raiser has just cause to be very well satisfied with the financial results of his labor.

The average fruit raiser should endeavor to improve the quality of his fruit and put them in more attractive packages, when his reward will be greater.

SAN JOSE SCALE.

CONUNDRUMS FOR THE WISE.

Are we getting control of this pest?

Are the efforts of the Department doing as much good as could be expected?

Has their work been as successful as represented?

Is the present mode of instruction all that it should be, both scientifically and practically?

Are not too many important points in the manufacture of the Lime and Sulphur wash overlooked, misunderstood, or too lightly dwelt upon?

Is there not too much guess-work, and in instances of failure attributed to climatic conditions, when it should be attributed to the conditions of the man?

Is an unpractical man capable of teaching for best practical results?

Is not an unpractical demonstration more of injury than benefit?

Should there not be a Department of Horticulture established, and put into immediate force, whose entire purpose should be to build up and improve our fruit industries of Pennsylvania, which at present stands second in the production of the apple, that this high grade may not only be maintained, but that it may be advanced to the front—the position it can so easily attain and hold, if it receives the intellectual and financial help to carry forward the work?

The CHAIRMAN: What shall be done with this report?

On motion, properly seconded, it was agreed to receive it and file it with the other papers for publication.

The CHAIRMAN: Discussion on these reports will now be in order.

MR. McHENRY: I move you, before we do this, that there be a committee appointed to wait on the Governor, and inform him that the State Board of Agriculture is in session, and of the place of meeting.

The motion was seconded, and agreed to.

The CHAIRMAN: I will appoint as that committee, Messrs. McHenry, Blyholder and Naginey. They will please wait on the Governor, and report to us the result of their interview.

MR. HUTCHISON: This livestock question is a very important one, and represents a great industry in this State. We discussed it at our meeting two years ago, and had some very good points brought out by Governor Beaver, and a number of others. In the Doctor's report of to-day, he says we discussed it, but have done nothing. Is it not a good time to have a committee appointed, either by the State Board, or the Legislative Committee, and have them prepare or formulate a bill along the line of improving our live stock, and in the way of making preparations to establish an addi-

tional department to work along that line? We may resolve, and talk along certain lines, but if we don't take hold and do something, the talk is all for nothing, and don't accomplish anything. Now, I think that following the report, it would be a good time to go into the matter, and have our Legislative Committee sometime during this session formulate a bill.

Talking about raising mules, reminds me of a time, a few years ago, that a few gentlemen went to Kentucky, and bought several carloads of mule colts. They are now about two years and a half old, and they have no trouble in selling them at a large profit. That is one object lesson that has come to my notice. Now, there is no reason why this breeding could not be done at home, and the extra thousands of dollars that we are sending out of Pennsylvania each year should be stopped, and the money kept at home.

The agitation against the Beef Trust amounts to a great deal to the farmers of Pennsylvania, and has got these farmers to thinking, and to-day home-dressed beef is a great deal more in demand than it was a few years ago, and the price of cattle has advanced in the State of Pennsylvania, and I think that the Livestock Breeders' Association should take hold of the live stock interest at once. I would move you now, that we appoint a committee to formulate a resolution to be presented to the Legislative Committee.

DR. TOWER: Mr. Chairman, that is exactly what I hoped, when I saw my old friend, Mr. Hutchison, come in. It would be impossible for me to have any other opinion. Ideas as to what the bill should contain should be given to this committee. Would it not be a good idea to point out to the committee what this bill should contain, before it goes to the Legislative Committee?

MR. HUTCHISON: I am interested in it, and am willing to work along the line in any way. Traveling all over the State, as I do, I see how much better the horse is, raised in Pennsylvania, than the one raised in Illinois, and I am willing to work along any line that may be suggested, to improve this industry.

The CHAIRMAN: It might be well to appoint a committee to formulate a resolution to present to the Legislative Committee. As Chairman of the Legislative Committee, it seems to me that it would be well to have the opinions of the members of the Board who are present. The Legislative Committee will be only too glad to receive any personal ideas, and now would be the time to do it.

A Member: I want to endorse what the Chairman of the Legislative Committee has just said; I don't think we can spend time on a subject of greater importance.

MR. McCLELLAN: I should like to say something regarding the horses that are brought in and sold at high prices throughout the country. People who buy from peddlers usually pay a very high price for a very poor article, but it is their own fault for buying this way. If they went direct to the breeder, they would get a better horse at forty per cent. less money. The horses that are peddled throughout the State, are those that no good horseman would buy. I have been told by two or three breeders in Indiana

and Ohio, that they must have from thirty to forty per cent. more for horses if they peddle them out. They must pay for the horses' keep for three or four months, and also the expenses of the man, and they must have a higher price.

The SECRETARY: I would like to say right here that we would like to get the name of every one that participates in these proceedings, so that when you come to read the report, you may know just what was said, and who said it. If the Chairman is unable to give the name, we would be very glad if you would mention your name, so that we may have the record.

EX-SECRETARY EDGE: The main part of the question seems to be the appropriation. Now, we can hardly hope to secure this this year, but if we present the bill properly, and arouse the interest of our people, we will probably have no trouble to get it by another year.

MR. HALL: It seems to me that we are a little tender of the prerogatives of the Legislative Committee. Would it not be well for the Chairman to appoint a time to hear those who have anything to be brought before this committee? If we don't want to appoint a committee, we could go along this line.

MR. HUTCHISON: I have great respect for Ex-Secretary Edge's opinion along this line. He has done a great deal for this State. And as he says, the great thing is the appropriation. We want in this State an appropriation of four or five thousand dollars for the improvement of live stock, the same as they have in Belgium. One way of getting the people interested is the money. That will bring about results. The suggestion of Mr. Hall is a good one, that the Legislative Committee sit while we are here, to get the opinions of those interested in the matter. We may be able to thrash something out of this, and get something for good. These are times when people are coming here, and asking for large appropriations for every good cause, and why should not the agriculturists have their share? So why not see the Governor, and tell him what we want?

MR. NELSON: I would like to ask for information, whether Brother Hutchison intends to include that small, but industrious insect, the bee, in the live stock interests of Pennsylvania? If he does, it will be a very good thing.

I think that those opposed to the creation of an additional department, may come in with us if the work is done, and the appropriation asked for, by the State Board of Agriculture. And if the Stock Breeders' Association, and the Dairy Union, and similar organizations, would join with us, it would enable us to get a larger appropriation.

The CHAIR: I believe the proper thing to do is for us to reduce the matter to a resolution, and let this resolution be handed in to the Legislative Committee. And I would say in regard to the other organizations coming in with us, that I understand this will be the case. We will have resolutions from our other organizations, and can embody them in the bill. Now, the way to do things is to do

them, and unless we do them our talk will not amount to anything. Put it in the form of a resolution, and then this can be brought before the Legislative Committee.

A Member: There is a motion before the house, which should be disposed of before we go any further.

The CHAIR: The Chair's impression of the motion was something like this: That the Chair appoint a committee to formulate a resolution to be presented to the Legislative Committee. That is my impression of the motion. If I am mistaken, will you please make the necessary correction?

MR. HUTCHISON: I beg your pardon for speaking so often. The one thing to do is to get this thing under way. I have great respect for the bee; there seems to be a future for it; and if it will help us to get the appropriation, I am willing to include it. But the thing is to return to our subject, and get it under way.

DR. FUNK: Mr. Chairman, if they include the bee, they will have to include horticulture to support the bee.

The CHAIR: Are there any further remarks, or are you ready for the question? Has that motion been seconded?

The motion having been regularly seconded, and the question put, it was agreed that the Chair should appoint a Committee to formulate a resolution to be presented to the Legislative Committee.

The CHAIRMAN: I will appoint the following gentleman to serve on this committee: Mr. Hutchison, Dr. Tower, Mr. Nelson, Dr. Funk, and Mr. Chubbuck. They will please formulate such a resolution, and present it to the Legislative Committee for action.

The CHAIRMAN: Next in order is on the report of Dr. Funk, the Pomologist; we will willingly hear any remarks on his admirable paper.

MR. SEXTON: I would like to ask the Doctor what he considers the best thing that has yet been found for the San José Scale, and further, whether some of the Scalecides that are now on the market, and are so much easier to prepare than the lime, sulphur and salt, would not answer the purpose just as well? The lime, sulphur and salt, is troublesome to prepare, and I would like to know whether there is not something that can be bought, and mixed with water, that will answer the same purpose?

DR. FUNK: In answer to the question regarding lime, sulphur and salt, I would say that so far as known at the present time, there is nothing that equals it. And for this reason its purposes are dual. It is both a positive remedy for the San José Scale, and one of the best fungicides that we have at the present time. I believe it is a specific for the Peach Leaf Curl, and for the Manila or Brown Rot. Since I sprayed this winter I find that the Brown Rot has practically disappeared from my orchard. It also destroys the spores, but I have come to leave out the salt, and use only the lime and sulphur.

Now, as to other preparations, I would say that the crude oils are dangerous in the hands of most people, even in the form of kerosene,

etc., but there are several of the "cides," like scalecide, killicide, etc., that do admirable work to a certain extent; but they are not good for anything but the scale; they will not destroy the fungus. And another thing against them is their price. They sell from fifty cents a barrel to a dollar a gallon, and do not do the work that the lime and sulphur does. But there are preparations of soluble oils, for which the formula is now being prepared by the Department, for public use, which the farmer can prepare more easily than the lime and sulphur; they can be had at a very low price, and in such form that all the farmer need do is to get a gallon of them, and put it in twenty gallons of water. But it must be understood that this will destroy only the scale, and not the fungus.

The SECRETARY: Dr. Funk speaks of a bulletin that is now in the course of preparation in the hands of the printer, which will give all the information that the State of Pennsylvania has on the subject. I don't know how soon it will be out, as the printer is somewhat behind in his work, but I should say in the course of the next month or six weeks.

REPORT OF COMMITTEE ON CREDENTIALS.

MR. HERR: The Committee on Credentials would respectfully report that credentials have been received from the following persons; that all credentials have been examined and found correct, except the credentials from Clarion County are not on the form prepared for that purpose, and do not give the certificate that the Society is entitled to representation in the State Board:

Name.	Address.	Term Expires.
D. A. Knuppenburg,	Lake Carey, Wyoming Co.,	1910
J. D. Nevius,	Philadelphia,	1910
(Appointed by the State Poultry Association.)		
Horace Seamans,	Factoryville, Lackawanna Co.,	1910
Henry C. Snively,	Cleona, Lebanon Co.,	1910
Frank A. Davies,	Montrose, Susquehanna Co.,	1910
M. M. Naginey,	Milroy, Mifflin Co.,	1910
E. M. Davis,	Grampian, Clearfield Co.,	1910
W. E. Perham,	Niagara, Wayne Co.,	1910
Howard G. McGowan,	Geiger's Mills, Berks Co.,	1910
W. C. Lutz,	Bedford, Bedford Co.,	1909
A. T. Holman,	Millerstown, R. F. D., Perry Co.,	1910
S. M. McHenry,	Indiana, Indiana Co.,	1910
E. E. Chubbuck,	Rome, R. F. D. 6, Bradford Co.,	1910
N. M. Biddle,	Carmichael, Greene Co.,	1910
Peter B. Cowan,	Brookville, Jefferson Co.,	1910
M. N. Clark,	Claridge, Westmoreland Co.,	1910
S. X. McClellan,	Knox, Clarion Co.,	1910

The committee still further report that they have examined the credentials of the following persons, representing Agricultural Organizations, and recommend that they be admitted to sit as Advisory Members:

S. P. Heilman, Heilmandale, Lebanon county.
 M. D. Heilman, Heilmandale, Lebanon county.
 Ira J. Light, Lebanon, R. F. D. 5, Lebanon county.
 J. F. Brubaker, Lebanon, R. F. D. 7, Lebanon county.
 J. P. Brendle, Shaefferstown, Lebanon county.
 Moses Yingst, Prescott, Lebanon county.
 John H. Bennitch, Richland, Lebanon county.
 H. M. Keller, Biglerville, Adams county.

J. A. HERR,
 S. S. BLYHOLDER,
 SAMUEL McCREARY,
 R. F. SCHWARZ,
 J. N. GLOVER,
 Committee on Credentials.

It was moved and seconded that the report be received and adopted as read, and that the members named in the report should be seated as recommended. Agreed to.

On motion, duly seconded and agreed to, the following gentlemen were elected as Advisory Members: James E. Stephens, J. E. Fleisher and William Wertz, representing The Perry County Agricultural Society, and Hon. W. C. Pomeroy and Scott McLaughlin, representing Juniata County Agricultural Society.

MR. SCHWARZ: I agree most heartily with Dr. Funk that there is nothing like the lime, sulphur and salt for the San José Scale; but if the statement is true that was made at an institute in Northampton county, that Dr. Miller had started to spray with scalecide and found, after the season was over, that it had destroyed all indications of fungus, it should be looked into. It is much easier to prepare than the lime, sulphur and salt, and if it is any good, I think the Department should authorize it, and tell the farmers to use it, if they can't do any better.

The CHAIRMAN: In connection with what has been said, the Chair has had some experience with scalecide, and that is just this: In the first instance, it does not go near as far as they say it would.

MR. HALL: I just wish to suggest to Dr. Funk where he said it costs from a dollar a gallon to fifty cents a barrel, that he probably meant to reverse these figures.

MR. HERR: I don't think it is the policy for the Board to recommend any patent preparation on any subject to any member of the Board. It is true these things are on the market, and we have no objection to the individual using them giving the party a testimonial, if he wishes, but I don't believe the Board should commit themselves.

DR. FUNK: From the soluble oils, for which the formula will soon be published, the user will get better results than from the preparations that are now on the market. Those on the market are all manufactured according to one formula, but if you make the soluble oil preparations yourself, you can make them mild or drastic, just as you want them. Now, if you have an apple tree that is in an

advanced stage, you will want it much more drastic than you will for a peach tree that is just starting. If you make it yourself, you can make the ratio high or light, just as you wish. You can make it 14 to 1, or 20 to 1, just as you like. So I think they will be better than the preparations on the market.

MR. HUTCHISON: There was a suggestion made that we create a Department of Horticulture. I presume this will be a part of the Board of Agriculture, and I think this should be done because the Department of Horticulture is an important one, and I think the Board should take some action toward creating this Department.

MR. CLARK: I don't want to offer any results, but I want to tell you what we did on our farm in Southern Indiana the past few years. We tried to see first what we could do with lime, sulphur and salt, but it is so troublesome to prepare that we finally decided to see what could be done with kerosene. We did so, and I want to tell you the result. The Scale, I suppose, is as nearly destroyed in our orchards there, as in any other orchards, where they have used other preparations. We lost a few trees by too much oil, but very few in comparison to the whole number. But I noticed this: the loose bark on the trees nearly all fell off, and the trees are quite smooth. There is no place for the little insects to harbor. We are so well satisfied that we shall continue to use it.

MR. HUTCHISON: Did you dilute it?

MR. CLARK: No, not on the larger trees, but on the smaller trees we used about 1 to 20, and the smaller trees were the ones we lost.

The CHAIRMAN: Will the gentleman please tell us on what kind of trees he used it?

MR. CLARK: Peach, apple and pear. We are too far south to raise a good apple, but our apples were as fair as any on the market; the peach crop was a failure this year in our neighborhood. But this is the home of the Kieffer pear, and we shipped the largest Kieffer pears on the Louisville market. Two other parties shipped probably as good; none better. Now, I tell you this just to show you what can be done. The good pears that were taken to the market commanded a good price. I tell you that we shall continue its use. Unless farmers do something, they will have to go out of the business, and it is the hardest thing in the world to get a farmer to use lime, sulphur and salt. There are only two things to keep in mind in the use of kerosene: to be careful and to use a small quantity. We can easily use it.

MR. SNAVELY: I want to put this question to Dr. Funk: whether the use of these crude oils is not going to prove eventually destructive to the tree?

DR. FUNK: It certainly will; we know that all oils will injure the tissue of all vegetable matter. We know that pure kerosene will destroy the scale, and if a man will select for his work an ideal day, and force the pressure through an exceedingly fine orifice, making an exceedingly fine mist, it may be all right, but the danger is that he

may destroy all his fruit. There is where I consider the soluble oils will come in. We will then know exactly what we are doing. When mixed with fourteen or twenty gallons of water, you have a preparation that will not injure the tree as much as a pure oil will. If I were going to use a pure oil, I would use kerosene, instead of crude oil, because it will not leave a varnish.

MR. WELD: I want to ask Dr. Funk whether this year has been peculiar in the development of the Oyster Shell Scale? It has been present in my orchard, and some of my friends', and I think it is thicker than I have ever seen it before, and we must, in our county, report the death of some trees from it. I don't think we are infected, because we were examined early in June, and no scale reported. Now, is it peculiar to this winter, and what had we better do with it? Is there any danger of it increasing, and destroying the orchards further?

DR. FUNK: The Oyster Shell Scale is one of the three scales that infest our orchards here—the San José Scale, the Oyster Shell Scale, and the Scurfy Scale. But where the trees are thoroughly and completely sprayed with lime, sulphur and salt, it will destroy the San José Scale, the Oyster Shell Scale, and the Scurfy Scale, and we have also found that it will destroy the Tent Caterpillar. It used to be considered impossible to destroy the nest of the Green Aphis, but we find that if we use the lime, sulphur and salt, we will destroy all of them.

MR. WELD: There is danger, then, of that Scale increasing, and giving us very serious trouble?

DR. FUNK: It certainly will destroy the trees.

MR. SNAVELY: Which increases the quicker, the San José Scale or the Scurfy Scale?

DR. FUNK: Where we have four or five progenies of the San José Scale, we have here but one; when we come down to latitude 38 degrees, we have two, but here we have only one.

MR. WELD: How many broods has the Oyster Shell?

DR. FUNK: Only one on an average, but in long seasons, you may have two.

MR. RODGERS: What time of the year do you put on the lime, sulphur and salt, and what time the oils?

DR. FUNK: I would prefer using the oils just as late as I could; just before the blossoms swell; there is more resistant power at that time. As I say, I am a little scary on the oil question, but some trees are more resistant than others. Take the Ben Davis, and the York Imperial; they are both infected. You examine the Ben Davis, and you will find it infected down to the red, while the other will hardly be touched. Why the San José Scale discriminates thus, I leave to you.

MR. RODGERS: What kind of a day would you use—a clear, sunshiny day?

DR. FUNK: Most certainly; I want a quiet, sunshiny day, or it will not dissolve the oils as quickly as necessary.

MR. SNAVELY: A few other matters I want to ask the Doctor: Whether it is safe to spray any time after the foliage is off the trees? Now, my experience is that it is not safe to spray peach trees with salt. We cut it out altogether, and use only the lime and sulphur. In my experience, it is not safe to use salt; it has killed a large number of buds.

DR. FUNK: Can't you go further, and say terminals?

MR. SNAVELY: No; but I can say that it is not safe to use salt on peach, or Japan plum trees in the fall.

DR. FUNK: I think if you will go back to my last year's report, you will find that I say the terminals on peach trees were killed by the use of salt in the fall, and I would not think it safe to spray a tree in the fall, but in the spring, when they have the most resistant power.

MR. RODGERS: Heretofore, at our meetings, you have recommended lime, sulphur, and salt, and now you do away with the salt; for what reason do you do away with the salt?

DR. FUNK: Because it is useless; I find it is even injurious on tender leaves, owing to the chlorine in salt, and it is a large expense, and I find that the lime and sulphur adheres equally long without it. I can show you trees in my orchard that we sprayed last spring, where it is still on. Experience, you know, improves us, all along the line.

MR. GLOVER: I would like to know whether you know of any one who is fixed up to go around and spray for farmers?

DR. FUNK: There is a party near Germantown who is doing that kind of work, but I don't believe it will ever be a success. Anybody may fix up a machine to do this, but I don't believe it will ever be a success, because weather conditions will not warrant it. You can spray with an October wind, but you can't spray against it; now, when we were spraying our orchard last winter, the wind blew in one direction for all the time except three days. We had all our orchard covered on one side, and only three days to spray the other in. Now take a case like this; he may go and spray for John Jones or Peter Smith, and may spray on one side for fifteen days, and then have only three days to spray the other in, and his engagements would make it necessary for him to go to some other orchard; what would be the result? Why, the orchard being only sprayed on one side, and the work incomplete, the man would refuse to pay for it, because the work was not done according to contract.

Any man can get a hand pan of eighty to one hundred pounds pressure, and then he can go around and spray his trees. Then he

will be successful. So long as you have some one to work for you by contract, you will never be successful. He will want to go from one job to the other, and this will leave just so many trees more for the following summer.

The CHAIRMAN: If there is no further discussion, we will go on with the next number on the program, which is Unfinished Business.

It appeared that there was no Unfinished Business to be brought before the house.

MR. HUTCHISON: We have with us Professor Hunt of the Experiment Station, who was also with us last year, and we shall be pleased to have him say a word.

PROF. HUNT: I think, with your permission, I will not take up any of your time this morning. It is very kind of you to give me the opportunity to address you, but as I am to speak to-morrow morning, I will not take up your time now. I thank you for the kindness, and trust I shall become better acquainted with you before the end of the Convention.

MR. SNAVELY: If there is no other business before the Board, we might as well proceed with the election of officers.

The CHAIRMAN: That does not take place until Wednesday morning, according to the By-laws; but since there is no Unfinished Business, we shall be glad to hear from any one before we take a recess.

DR. FUNK: I would like to hear from some of these people who have sprayed with lime, sulphur and salt, or who have had demonstrations on their places.

MR. SEXTON: I would like to inform the Doctor of my experience with lime, sulphur and salt. The subject is an important one, and one well worth talking about, and while we are on it, we may be able to learn a great deal if we continue the discussion. About two years ago, when our trees should have been sprayed, I was too busy to attend to it myself. There is a nurseryman not far away, who has the paraphernalia and goes around the township spraying trees, so I had him come and spray mine; my trees were badly infected, and are still, although they have been twice sprayed with lime, sulphur and salt. How do you account for that?

DR. FUNK: I hope this will bring up one of the Conundrums.

MR. SEAVY: Some of my neighbors and I found that we had the San José Scale, and we had a man down from Erie County to look at our trees; he said, "You have the San José Scale, and your trees will die." But he set at it, and we all went there to see the work. He mixed the lime, sulphur and salt; it was an ideal day, and we watched him spray. Of the plum trees, some were dead, some dying; some he cut down. This man sprayed twice, and there is no more scale there. This year we had a large crop, which we sold for two dollars a bushel. I suppose we lost about twenty-five or thirty trees before we knew what was the matter, and before we saw the State demonstration of lime, sulphur and salt.

The CHAIRMAN: I understand the Doctor to ask for any expression in regard to the demonstrations; we had them in our county. I had one on my place. Climatic conditions were against me, but the neighbors came to see the demonstration. It was impossible to spray one side of the trees; as fast as we sprayed, it blew away, and the result was that there was very little good accomplished. One of my neighbors had a young orchard which was badly infested with the Scale, and he concluded he would try it again. There was one tree that I thought was about dead, and advised him to cut it down, but he said "there is life in it yet," and took advantage of the weather, and sprayed it again, and to-day it is as thrifty a young orchard as there is in the State. We have cut out the salt, as has already been said.

MR. LUTZ: I would like to talk, but I am troubled with paralysis, and it is hard for me to speak; the paralysis has affected my speech; but I would like to hear more of the subject, because Bedford County, where I come from, is badly troubled with the Scale. One man had twenty thousand trees and they all had Scale.

The SECRETARY: This is a matter in which the Department is very deeply interested. I hope it will be freely and thoroughly discussed. What has the Department accomplished in this last year? You will realize that the Department should not expect to rid the entire State of the Scale the first year, or, in fact, that the State should do it at all. All we expected was, that the demonstrator should go over the State, and get the people interested, so as to do the work for themselves. They should know where the Scale is present, and what to do. It has been a sort of school, and we are anxious to know what results have been accomplished. I was very glad when Dr. Funk said he would like to hear. And I would like to hear from the people who have had demonstrations in their neighborhoods, or on their farms.

MR. HERR: Will not this same subject come up this evening, under the head of the Entomologist's Report?

The SECRETARY: The only reason I hope there will be considerable said on this subject, is because we have the time.

DR. FUNK: We have the people here, also, and the experts.

MR. SCHWARZ: If the demonstrations made by the experts have not been a success, it is because we could not get the people interested. I was sorry for the young man who came to our neighborhood. I gave him my orchard, and we advertised it for weeks, but we had only three people there. The most we had was eight people, and they came there out of curiosity, and not as a matter of real interest. It seems impossible to impress on the people of Pennsylvania the terrible danger that is confronting them. If it has not been a success, it is only because the farmers of Pennsylvania take no interest in it.

MR. CHUBBUCK: I would like to ask Dr. Funk, whether there is anything in the manner of operating, or whether it is that the operation itself has no effect, in a case where it didn't do any good?

DR. FUNK: It makes all the difference; if we spray right, with the proper mixture, we have a killing agent; if we do not spray right, we do not have the killing agent, and are short our time and money. In this regard I submit to an impartial demonstration. I would like to see this point discussed. If this thing goes on, in a few years we will have no farm orchards, and I think it is a most important question. Of course, if we let it come to that, it will be a bonanza to the few experts who, through time and attention, can continue to raise fruit, but I fear the farmer will only realize that when it is too late.

MR. STOUT: The Zoologist sent out a man to my place to fumigate the trees, possibly three hundred, but the results are not satisfactory—not as satisfactory as spraying. We sprayed ourselves, and we had very satisfactory results. We had been spraying before he fumigated, and he said the results would be all right, but they were not.

DR. FUNK: There is another subject I would like to talk of—fumigation. Now, we know that you can successfully fumigate a large tree, but in regard to nursery stock, it is only too often the case that the trees have been fumigated before they were sent out, and fumigated to death, so that they will not grow, and the question resolves itself into this: shall we have fumigation, or shall we not? Before I fumigated, if I lost ten per cent., I lost much; since I am fumigating, I am losing forty per cent. Why, this season I had some fine apple trees—as fine apple trees as you could find, before fumigation; since fumigating, forty per cent. of them have died. Out of one hundred unfumigated trees not one died. Now, is this not a danger? If the remedy is worse than the disease, is it not a danger? Now, the question is whether we shall not kill the whole of what we are trying to save.

MR. SNAVELY: I think the Doctor has struck the keynote of this whole business of fumigating. A large per cent. of the trees sent out by nurserymen are trees that will not grow.

MR. HERR: I want to ask the Doctor if there are not certain varieties of apples that the Scale takes to, more than others? Isn't the Ben Davis the one it takes to most of all? It is not as particular as I am; I haven't much use for the Ben Davis. But why is this?

DR. FUNK: The Scale is generally carried by some outside influence, by birds, or something of that kind. It has no wings to fly, but, of course, where the insects are carried, they stay and do their work, and it is a fact that they will take to the Ben Davis quicker than to any other kind. I think the Ben Davis has a weaker constitution, and less resisting power.

MR. SNAVELY: Dr. Funk has not, I think, touched on one important feature, and that is the summer spraying. A great many people make the mistake of putting sulphur on their trees to destroy the rot, and the next thing they know, they have no foliage on their trees.

DR. FUNK: Do I understand this to be merely in reference to the Manila or Brown Rot, or do I understand it to be also in reference to the Scale?

MR. SNAVELY: For both.

DR. FUNK: Of course, in summer spraying it is impossible to use lime, sulphur and salt, so we have to resort to other means. Now, there is nothing, in my opinion, that will quite equal a high ratio soluble oil, so far as the scale is concerned, because you can use it frequently, and still not destroy the foliage, and you will destroy all the lice, but you can't destroy all the scale at once, so you must spray every few days to destroy all that are being born. Now, as to the matter of the time of spraying: It has the same advantageous effect on the cherry, peach and plum, and we can begin immediately after the bloom drops with a Bordeaux mixture, composed of two pounds of sulphate of copper, six of lime, and six gallons of water. But during the peach season we can't use this; we must have it so well diluted that it will not affect the tree; several years ago I used on my trees a mixture made of four ounces of sulphate of copper and fifty gallons of water. You will say that is exceedingly weak, and yet, inside a week the trees did not have a single leaf on them, but they were so well developed that the fruit went ahead and ripened. I reduced it to three ounces of sulphate of copper and fifty gallons of water, and again I removed three-fourth of the foliage. The next season I used two ounces, and fifty gallons of water, and since that time I have lost no leaves. It is very weak; you could drink it without harm, and yet it has proven strong enough to kill typhoid germs, and I see it is now recommended for that purpose.

The Committee appointed to wait on the Governor reported that they have been unable to see him; he is occupied with some people from New York State; but they will return again and try to see him before lunch.

The CHAIRMAN: The Secretary's report, under the head of New Business, gives the next place of meeting; but before we proceed with that I wish to announce that the Legislative Committee will meet this afternoon right after the session, at the close of the afternoon session; members who have anything to report to them will be welcome.

MR. FENSTERMAKER: If the place of meeting is next in order, I would present the claims of my city. The city of Allentown has a great many advantages in many respects. We have excellent railroad facilities and good hotels, and you know the Lehigh County Dutch are noted for their good cooking, and you can have your choice of peanuts or beer, or both. Then, about the time of the Spring Meeting, the great cattle importer, Mr. Cooper, of Coopersburg, has his annual cattle sale. His place is easily reached by trolley from Allentown in half an hour, and we could attend the sale in the afternoon and get back in time for the evening session. It would be a good object lesson for us to see the fine cattle there that sell for thousands of dollars. These sales will not continue indefinitely; in fact, they may end at any time. Mr. Cooper reports that when he has a sale and gets good prices they raise the price on him, so that he may

not be able to get cattle from them anymore. I am in receipt of a letter from him giving us a very cordial invitation to be present at the next sale.

Then, there will be no trouble in securing a good place to hold our meetings. We can have the court house. And we have the public parks, and some large stores, that are well worth seeing, and at the other end of town there is Allentown's famous duck farm, where they have between forty and fifty thousand young ducks in the various stages of growth. I trust we shall have the pleasure of seeing you all at Allentown in the spring.

MR. SCHWARZ: I second the nomination of Allentown.

MR. SEXTON: When is this cattle sale to be held?

MR. FENSTERMAKER: Usually on Decoration Day.

MR. SEXTON: I am a Grand Army man, and as such I can't go to a sale on that day. As a Grand Army man I have other business. I march to the graves of my fallen comrades. If that is the object that takes us to Allentown I can't go there.

MR. FENSTERMAKER: That is not the object; it is merely discretionary; no one is compelled to go to this sale.

The CHAIRMAN: It is usually customary to hold the spring meeting on Decoration Day.

MR. BARNES: I wish to offer as a place of meeting, the city of York. We have a court house that is unsurpassed by any in the State, and we have first-class hotels. I therefore offer York as the place for the summer meeting.

The SECRETARY: We had the pleasure of meeting several years ago at Somerset, in the southwestern part of the State. It gave us a great deal of pleasure to have you there, and I am happy to say that it would give us pleasure to have you return there. I would, therefore, offer Somerset.

MR. McCREARY: Inasmuch as Mr. Riddle, of Butler, is anxious to have us come there, and is not present at this time, I would be glad to have the balloting held over until he can present the claims of his home town of Butler. He will be here some time today.

MR. HERR: When is the time of the summer meeting fixed?

The SECRETARY: That is left to the Director of Institutes; he fixes the time and we fix the place.

DEPUTY SECRETARY MARTIN: There is one question in regard to these meetings with which we have had considerable difficulty for a number of years. Now, in the town of Clearfield, where we had our last meeting, it was far from our desire to hold that meeting on Decoration Day, and in fact we had arranged two other dates, but found that on one of those dates it conflicted with the date of court in Clearfield, and in the other with another objection equally unconquerable, so we were between the upper and nether millstone of postponing our meeting until that time. We should have, at all

places where these meetings are held, the option of the court house or the opera house. Circumstances seemed to compel us in that direction, although we didn't want to have the meeting on Memorial Day. It is gratifying to us to have so many requests for the meeting, but that offer should always be made with the understanding that we can have either the opera house or the court house, so that we may have no difficulty in arranging the date of the meeting.

MR.-HERR: I know that we can have the court house at any time we want it, if it is the desire of the board to meet at Lock Haven, which is just as accessible, and where we will be entertained just as well as at any other place, and even a little better. We have no desire to crowd out any other place, but if it is the desire of the Board to meet at Lock Haven we shall be glad to have them.

MR. SEXTON: I wish to ask the Deputy Secretary of Agriculture, in fixing the day, not to fix it on the day devoted to the memory of my fallen comrades, so that we can all attend the meeting. Now, at the meeting at Clearfield, we lost a day of good work that we should have had, by attending a memorial meeting away from home. We could not hold the interest of the people; their hearts were elsewhere, and I am sure, Mr. Secretary, that if we hold this meeting at that time again we shall have the same trouble. People want to attend the memorial services, and want to do so at home.

MR. FENSTERMAKER: I am heartily in accord with the sentiments of that gentleman, but we have memorial services at Allentown, too, and those who wish to attend them can do so, and still go to Coopersburg to the sale. And I will guarantee a hall for any date you set, if you come to Allentown.

The SECRETARY: If you come to Somerset you will find a new court house and a good opera house, to either of which you will be welcome.

DEPUTY SECRETARY MARTIN: Just a word of explanation. With the exception of one place of meeting held in Pennsylvania, we had the opera house or the court house free of charge, and it is important that we should have it free of charge. The people of Clearfield were very kind and very generous, and it was understood that all we were to pay there was to see that the janitor was rewarded for his services in the matter of light and heat. It was the same at Huntingdon, and all other places except one, and I wish the gentlemen requesting us to meet with them would bear in mind that we expect to have our meeting place free of charge.

MR. FENSTERMAKER: You will not be expected to pay at Allentown; I will guarantee a good hall in which to hold the meetings free of charge to the Board.

MR. HUTCHISON: I move that the roll be called and each member answer to his name.

Duly seconded and agreed to.

The ballot resulted as follows: Allentown, 21 votes; Somerset, 4; York, 4; Butler, 1; Lock Haven, 1. Allentown having received the

highest number of votes, was declared to be the next place of meeting.

MR. HUTCHISON: I would like to change my vote to Allentown.

MR. RODGERS: I move that we make Allentown unanimous.

Duly seconded and agreed to and Allentown was unanimously selected as the place of the spring meeting.

On motion, properly seconded, it was agreed to adjourn until 1:30 p. m.

1:30 P. M., Tuesday, January 22, 1907.

The meeting was called to order by the Chairman, Mr. Kahler.

The CHAIRMAN: If Prof. Boyer is in the room we will hear the report of the Committee on Fruit and Fruit Culture.

Prof. Boyer did not appear to be present.

The CHAIRMAN: Is Dr. Pearson here?

Dr. Pearson was not present at the time.

The CHAIRMAN: Next on the program is Prof. Butz, of State College; is he here?

Prof. Butz was not present at the time.

The CHAIRMAN: Next in order is the report of J. W. Nelson, Chairman of the Committee on Apiary. We will now have his report.

This report is as follows:

REPORT OF COMMITTEE ON APIARY.

BY MR. J. W. NELSON, *Chairman*.

The season of 1906 has been a very good one for bee-keepers. The winter of 1905 and 1906 was mild and the winter losses were light for outside wintering, the early spring favorable for brood rearing and the bad weather that followed not as severe as usual. Those who have worked for surplus honey have had good returns, while those who have worked for increase have been unusually successful, in my case amounting to fourfold, all in good condition, with some surplus honey.

There has been an unusually large number of colonies of bees in the woods this summer. I have transferred eight colonies from trees to frame hives. One of them was hanging on a tree about twenty-five feet high, and had been there about twenty-one days. I had one case of foul brood, and tried the following plan: I shook the old bees and queen out and then took the old and diseased brood to a new location. I had shaken about all the bees off, and as the larvae were badly diseased I closed the entrance for two days to keep out robbers, and then opened it just enough for one bee at a time. After seven

seven days I destroyed all the queen cells, and after a few days more I gave them a frame with a few unsealed larvae to keep them in good condition. At the end of twenty-one days I destroyed the cells on this cone and gave them some selected larvae to raise a queen from, and the built up nicely and were one of the best colonies I had when the season closed. I did not fare so well with the old bees and queen. I put them on some empty frames in an old hive for two days, and then put them in a good frame hive. I think all would have gone well, but I wanted to give them a chance to hurry up, and so put in some old combs I thought were clean. When I examined them again I had a good case of foul brood on my hands. As the buckwheat season was close at hand, I thought I would wait until then, as I find it pays to kill the old queen at that season anyway, but when the time came I could find no sign of the disease. I believe this is often the case in a flow of honey. I think the excitement caused by the unusual supply of nectar has something to do with it, but what becomes of the bacteria in the honey? Whether the disease that has done so much damage, but if I can get samples next summer I will send them to Dr. White, of Washington, D. C., for analysis.

The season closed with fine weather in September, giving us a flow of honey from fall flowers, late in the season, and plenty of young bees to go into winter quarters with. During the summer I discovered what is to me a new enemy of the bee, viz: the Cherry Bird or Cedar Wax Wing. Having heard that they were fond of bees, I doubted it, as it is often hard to get definite information on these matters. But having occasion to cut a bee tree one foggy morning, I found a large flock of these birds watching the tree, and as fast as a bee would come out they would catch it. I could see the bee plainly until it disappeared in the bird's bill. I watched them until I was sure as to what they were doing, when I tried to drive them away, but I had hard work to keep them away, as they seemed to think the bees good food. As these birds are plenty, it will pay bee keepers to keep an eye on them.

The United States government is getting very much interested in Agriculture, having carried out numerous experiments in different lines. Dr. White has been carrying out experiments with the bacteria of brood diseases. Prof. Phillips has also been busily engaged and Prof. Frank Benton has been traveling in foreign lands, mostly in Russian Caucasus, in search of new races of bees.

There are several races of bees in Northeastern Europe that promise some improvement, mostly in the way of gentleness, especially the Caucasian and Abasian races. The former has been tried by several bee keepers in this country with varying results. It will perhaps be as well for the average bee keeper to confine his energies to the good old Italian bees, and let the specialists experiment with the new races, as they might get a repetition of the English Sparrow nuisance. There are some twelve to eighteen specimens of stingless bees in South America, but little is yet known about them.

As we now have a national pure food law, that is a bright prospect for the intelligent honey producer. There is only one drawback, viz, brood diseases. The State government should lose no time in passing a strict foul brood law. I think there should be an inspector of apiaries, with as many assistants as necessary to do the work,

that both the inspector and assistants should be practical bee men of long experience and should be appointed by and under the control of the Department of Agriculture, and be paid by the State.

Below is a list of questions sent out by the Department of Agriculture, at Washington, D. C., to the inspectors of apiaries of the State of New York:

1. How should an inspector of apiaries be appointed?

On petition of persons.

On application of bee keepers' associations.

On application of associations to their Department of Agriculture, as the State should pay for the work just the same as in the case of diseased cattle, and should therefore have supervision of the work.

2. Who should appoint the inspector of apiaries?

Department of Agriculture.

3. Should an inspector be chosen by competitive examination?

Yes.

4. What provision should be made for the removal of an inspector for cause?

If incompetent, the Department of Agriculture should remove him, but if competent he should be retained, as he will become more valuable as he gains in experience in handling men.

5. When any contagious disease is found in apiary, how long a time should be allowed the owner or manager to treat the disease?

This should be left to the discretion of the inspector, as a set rule might do an injustice.

6. If the owner or manager refuses to treat or destroy diseased colonies, should the inspector be employed to treat or destroy, as occasion demands?

Most certainly.

7. Should an infected apiary, which has not been cared for, be declared a nuisance?

It is not necessary to declare it a nuisance, as it is such, and the inspector will attend to it.

8. What should be the penalty for refusing to follow directions of an inspector to treat or destroy?

Fine

Imprisonment

One or both. Both at the discretion of the court.

9. Should an inspector be empowered to order all bees in hives without frames put into hives with movable frames in localities where disease is present?

If the inspector has tact and diplomacy, it would be all right, and if not, all wrong.

10. Should there be a penalty for concealing contagious disease from the inspector?

Yes.

11. Should there be a penalty for concealing contagious disease from a prospective purchaser?

Yes.

12. Should there be a penalty for moving bees from diseased apiaries to another part of the same State without the consent of the inspector?

Yes.

13. Should there be a penalty for moving bees without the consent of the inspector from apiaries in localities where disease is known to exist, even though no disease has as yet been found in said apiary?

Yes.

14. Should it be unlawful to move bees into another State without the consent of the inspector of the State from which they come?

Yes.

15. Should all colonies entering a State be examined by an inspector?

Yes.

16. Should there be a penalty for failing to notify the inspector of such shipment of colonies?

Certainly, or law falls flat.

17. Should there be a penalty for exposing contagious material, either honey, or appliances of the apiary?

Yes.

18. Should there be a penalty for selling, bartering or giving away contagious material, or material which has been exposed to infection, without the consent of the inspector?

Yes.

19. Should there be a penalty for refusing admission to the inspector or hindering him in the discharge of his duty?

Most emphatically.

20. Should it be declared a misdemeanor for any one, owner or otherwise, to have knowledge of the existence of disease, without notifying the inspector?

Yes.

21. Should the inspector be required by law to disinfect his person and all implements used, which would carry contamination?

Yes.

22. Should it be illegal for any person to rear queens for sale in an apiary where contagious disease exists or has existed within the same season?

He should be required to have his bees inspected, and have the consent of the inspector, twice each year.

23. Should the inspector make a public report of apiaries where contagious disease has been found, or should the report be made to the proper officials without publicity?

The report should be made to the proper officials.

24. Should the inspectors be at the expense of the State or county appointing an inspector, or should it be at the expense of the individual bee keeper?

At the expense of the State.

25. Should a special tax per colony be levied to pay the expense of inspection?

No. Should a tax be placed on each head of cattle to pay for inspection?

The above questions were sent by the Department of Agriculture, Washington, D. C., to the inspectors of apiaries of the State of New York, which questions cover the subject completely, and the answers to which I hope will meet with your approval.

Respectfully submitted,

The CHAIRMAN: What shall be done with this report?

MR. SEXTON: I move it be received and placed on file.

Motion duly seconded and agreed to.

The CHAIRMAN: Next in order is the report of the Committee on Roads and Road Laws.

The SECRETARY: Is Mr. Knuppenburg in the room? Yes; I see he is. I wish to state that we would like to have the Commissioner of Highways or his Deputy present when this paper is read. They are both out of the city today, but will be here tomorrow. Will you be here tomorrow, Mr. Knuppenburg?

MR. KNUPPENBURG: Yes, sir.

The SECRETARY: Then I move that this paper be held over until tomorrow, because there will be a great many questions that should be referred to them.

Motion duly seconded and agreed to.

The CHAIRMAN: We will take the next paper on the program, the Report of the Committee on Wool and Textile Fibres, by D. S. Taylor, Chairman.

Mr. Taylor read his report, as follows:

REPORT OF THE COMMITTEE ON WOOL AND TEXTILE FIBRES.

BY MR. D. S. TAYLOR, *Chairman*.

Your Committee would report that there has been some increase in the production of wool in the United States, as well as in the State of Pennsylvania. But there should be more wool produced in Pennsylvania, because some parts of our State produce better wool than can be produced in any part of the United States. And as we import a large amount of wool into the United States of different grades, we should produce in this country enough of wool to fill the demands of our manufacturers in the United States, and have wool for export, rather than import it.

The wool production of the United States in the year 1904 was 291,783,032 pounds; imported in 1904, 249,135,746 pounds; 540,918,778 pounds.

We take it that this amount was manufactured in the United States, as we do not find we export any wool.

The production of wool in the United States was, in 1905, 295,488,438 pounds; 1904, 291,783,032 pounds; an increase of 3,705,406 pounds.

From the best statistical reports at our command we find in the United States on January 1st, 1906, 50,631,619 sheep. Average price per head, \$3.54; total value, \$179,056,144.

Of this number Pennsylvania had on January 1, 1906, 1,102,982 head of sheep, value per head, \$4.63; total value, \$5,102,529. And on January 1st, 1905, Pennsylvania had 895,982 head of sheep; value per head, \$3.81; total value, \$3,415,394, being an increase of 206,076 sheep and of price, 82 cents per head, and of value, \$1,687,135.

The wool production of Pennsylvania on January 1, 1905, was reported as from 850,000 sheep at an average of six pounds per sheep, or 5,100,000 pounds, at 30 cents per pound, \$1,530,000.

Pennsylvania is reported as having on January 1st, 1906, 1,100,000 sheep at an average of six pounds of wool per sheep, or 6,600,000 pounds of wool; selling price advanced to 32 cents per pound, making the income from the crop of wool for 1906 \$2,112,000, being an increase from 1905 of \$582,000.

The increase of wool production in my county (Washington) of 1906 over 1905 was about 10 per cent., and an advance of 2 cents per pound. This information was obtained from wool merchants. The increase of sheep would have been more were it not for the increase of dogs in our county. Our county in 1906 paid for loss of stock by dogs \$6,505, and in 1905, \$5,656, an increase of \$849.

We had exhibited at one of our Farmers' Institutes in our county samples of fine wool grown in the locality where shown, which showed the length to be from the brood ewes $3\frac{1}{2}$ inches; sample from the stock ram, 3 inches, and from eight-months-old lambs, $3\frac{1}{2}$ inches. The standard length of staple, I understand, for fine or delaine wool, is 3 inches at one year's growth.

Your Committee would recommend to our Legislative Committee to try and have better protection from damage done by dogs to the human family and to our live stock. In our section of the State we have suffered much from mad dogs the past season. Many persons have been bitten and have been compelled to take treatment to prevent serious results. Near my home a worthy farmer and stock breeder was bitten by a stray dog; he thought it was not serious, but in a few weeks he became affected and suffered unknown agonies until death relieved him. His entire family and those who assisted in caring for him have been taken to a city hospital for treatment to prevent the spread of the dreadful disease. Much stock of all kinds in this section where this occurred, has already died, and it is expected that there are more cases developing.

The CHAIRMAN: You have all heard this report; what shall be done with it?

MR. CLARK: I move that we receive this report and place it on file.

The motion was duly seconded, and agreed to.

The CHAIRMAN. Are there any remarks on these reports which we have just heard? Probably by that time some of the Specialists will come in.

MR. WELD: I just want to endorse what Mr. Taylor said in regard to dogs. I was unfortunate enough to be a township auditor,

and from last March to November I was called upon five times to prove sheep that were killed by dogs. There does not seem to be any law to cover this, and it is a matter of interest to Warren as well as to Washington county. I think the Legislative Committee could do nothing that would benefit one branch, at least, of our live stock industry more than to better protect the sheep industry from the ravages of dogs. The unfortunate part of it is, in my section, that it is a lot of irresponsible and non-ownable curs that do this damage, and unless there is some law by which these curs can be shot at sight there is not much redress. The farmer who keeps a dog cares for him and feeds him, and houses him at night, and he knows where he is. It is the dogs that belong to people who are too poor to own anything else, that cause the trouble. They expect them to sponge their living off other people, and I want to endorse what this gentleman has just said, that it is important that there should be some restriction. We are the only county in the State under the Blair county law—

MR. CLARK: What is the purport of that law?

MR. WELD: It is simply this: That if you have sheeep killed by a dog you call upon the township auditor and have him come and assess the damages. Now, all dogs are taxed 50 cents each, which goes into the county fund as a special tax to defray damages done by dogs. Now, if you have a sheep killed by a dog, you call upon the county auditors, and they come and inquire whose dog it was and assess the damages.

MR. CLARK: Well, isn't that the State law? That is the State law.

MR. WELD: I think in some respects it is different from the State law.

The SECRETARY: I think the State law provides for one dollar or two dollars, according to the sex of the animal.

Mr. CRARK: Without any option for the auditors?

The SECRETARY: If the owner is willing to pay the price of the dog, the dog is saved; if not, he is killed.

MR. WELD: In our county that is not the law; if I catch a dog within my enclosure, I can kill him on sight. To illustrate this: There is a dog in our town that has been caught three times doing damage, but we can't catch him on the premises.

MR. CHUBBUCK: I have had some little experience in this line: I am a raiser to some extent, having sometimes as high as a hundred head. I am also an auditor, and I have spent many days for the dollar to prove sheep that were killed by worthless dogs. Now, a large part of the trouble in our county is with hunting dogs. They chase the sheep. They may not kill it outright, but they chase it so that it either dies from it, or is injured so that it has to be killed. They get in among the sheep and scatter them in every direction. I have had this experience within the last few days, and last year, when I was down here attending a meeting of the Board, the dogs got into the tract where my sheep were and worried them so that when I got

home I had a dead sheep on my hands. Now, the fact is, that under the State law you can't kill a dog. If your neighbor, or his cattle come into your enclosure you can obtain some redress if they do any damage, but when a dog kills your sheep, you have none. You may keep your dog law, but I tell you this: If I catch a dog among my sheep, chasing them, I will kill him if I can get him, regardless of the consequences. They ought not to be running at large at night. I had a case this fall where the hunting dogs chased my sheep until one of them died as the result of it. My hired man heard them in the night, but he didn't tell me of it, and in the morning we found them scattered everywhere and it took us some time to get them back again.

DR. FUNK: How comes it that dogs are not taxed?

MR. CHUBBUCK: They are taxed; don't you live in Pennsylvania?

DR. FUNK: I don't know anybody in Boyertown that pays tax, and the town is full of dogs. They get out of it in this way, by saying they don't own the dogs.

MR. CLARK: It seems to me that this comes up at every meeting; somebody has something to say about it. We should arrive at some conclusion so that we need not have it up at every meeting. Why is it that we are unable to accomplish anything? Our representatives should surely be able to frame a law that would be satisfactory to the people. But, now, there are two sides to the question. I had often heard of these great kennel shows, and for the past five or six years I have attended them. They were a revelation to me. You see there not only the finest animals, but the finest and best dressed and best bred people of the city of Pittsburg. They are all against anything like this; they say, "I take care of my dog; I don't allow him to go into your field, or into your yard, and yet you demand that I pay a royalty upon your sheep. I am willing to pay a tax on the dog, but when you expect me to pay a royalty on your sheep, it is going too far. I pay a tax on the dog, and then you expect me to insure your sheep." That is their side. Our side is that we want to prevent these dogs from killing our sheep. We have tried killing the dog, but I don't believe in any such demonstration as that; that ought to be a thing of the past. I believe in punishing the man, and not the dog. I believe when a man has a dog and don't keep him on his premises, except when he is out with him, we ought to make a law to punish the man so effectively that he will keep him on his own premises or kill him. Now, why can't we make a law so strong that it will accomplish this? It will satisfy the man who owns the dog, and the man who owns the sheep. What does our law amount to? Let us go back a moment. In my boyhood days, and even after I grew up, we had lots of sheep on our farms, and made money out of them; but I grew away from sheep raising. It was not because of dogs; it was because the timber was going, and we had nothing to fence in our land. Again, the timber being gone, new farming land was used, and the result was that the sheep industry died out. The man who raises sheep today can make money just the same as we did in my boyhood days. In my boyhood days, if a dog killed a sheep, we killed the dog. How is it today? You have a sheep killed by a dog and you go to the auditor and he proves

your sheep, and then you go the county commissioners, and get your money but you do not bother to go to the owner of the dog that killed your sheep. Now, why not frame some law that will keep that dog on his owner's premises? I don't want to see the man punished who keeps a dog on his farm for a good purpose, but on the other hand, up comes this thing that demands a law. Now let us get up a law that will go for these fellows and destroy this dog business that comes up every year.

MR. HUTCHISON: Let me ask you one question: How would you punish the man who owned a dog, but who owned no property; how would you punish him?

MR. CLARK: Shoot him.

MR. HUTCHISON: What, the man?

MR. CLARK: Why certainly; I would shoot him, too, if I couldn't do anything else, and feed him on bread and water.

The CHAIRMAN: Do you know that the dog gives that man more protection than you or I have?

MR. CLARK: He certainly does give him that, and a whole lot of privileges.

MR. SEXTON: We have talked this thing over year after year, until the subject has become very tiresome, and yet nothing has been done beyond making suggestions. Now, I want to add a little something in regard to sheep, and I tell you there is no domestic animal for which I have more love than I have for the sheep and its progeny, and I have seen the dogs come in and kill off my sheep to the number of twenty-five, and I know it was done by the neighbor's dogs, but I could not prove it, and had to go and get my pay. Now, is that all, to get our pay? Mr. Clark says he is satisfied to let them go under the state law. Let us try to get up a law such as he speaks of, and see what the result will be. Will the opposition come from the farmers? No; it will come from the general breeders of fine dogs, who go to these kennel shows that Mr. Clark speaks of. The only way we can keep sheep is to protect them from the dogs, and if we do not do that, these curs will drive us completely out of business. I tell you, the last carload of fine lambs that I bought at Buffalo and took down to Spring House, I put in a fine pen, well fenced, and yet the dogs got in there, and killed forty lambs in one night, and maimed a lot more. I had to send for the butcher to come and take away two wagon-loads of dead lambs. Why, I had on my farm sixty odd head of fine sheep, and they were all killed by the neighbor's dog, and the dog was chased right home, but we could not catch him, and that man swore that the dog had not been off his premises. There will never be anything done in this matter until the farmers of this Commonwealth take hold of the matter, and see that it is done.

MR. CLARK: What plan have you; in what way shall we proceed?

MR. SEXTON: Only to tax these dogs so heavily that they can't afford to have them round, and then make the fellow who takes the responsibility or the trouble, pay the fine of the irresponsible fellow.

DR. CONARD: Now, this matter seems to be discussed entirely from the sheep owners' point of view. I come from a county where

there are but few sheep, and yet it seems that where there are sheep it is detrimental to keep dogs, and where there are no sheep it is detrimental too. It is in this way: We are working under a law that authorizes the constable to collect one dollar, or two dollars dog tax, and when a sheep is killed, it is proved by the auditor, and the fine paid out of this tax. Now, since they have no sheep, they don't want to pay any dog tax, and the result is that we have dogs running around anywhere and everywhere and of a much inferior quality than where there are sheep, and they do a proportionate amount of damage. About a month ago I was called over the 'phone, and consulted about a dog that had gotten in among the neighbors' cattle, and was believed to have bitten nearly the whole bunch. He was afterwards killed, and his head sent to the University, for analysis, and he was found to be mad. I was afterwards called to the neighborhood where that dog was killed, and found four cases of hydrophobia. Now, we have the increased danger of carelessness, and you can multiply the danger of hydrophobia by two. So if we have no sheep we have trouble, and if we have sheep we have trouble. Now, there is a way to legislate these dogs into control. I am a friend to the dog, and would not legislate him out of existence, but I would legislate him into control. I think if we put a tax of from three to five dollars on every dog, regardless of sex, unless he or she was emasculated, there would not be so many dogs, but what there were, would be of good breed.

MR. NELSON: There is nothing, passing this question, that has been brought up today. We hear a great deal of the sheep side of the question, but in our towns and villages it is customary to have low fences, and in the town where I come from—Clearfield—there is a great deal of talk about dogs doing damage in the yard. At State College I saw the campus covered with dogs, and it is the same way in our town. Now, what about the danger of hydrophobia? How about the girls and boys who have suffered the torture of hydrophobia from the dogs? I think if you will turn to the report of 1903, you will find on page 212, a resolution that is fair to all parties. Now, Brother Jaekel and I have never found anything that covers all points as this resolution does, and we think that the influence of this Board should be used with the Legislative Committee to get this law passed. I want to be fair to the dog: I keep a Scotch Collie myself, but I keep him in a nice cage, and still, every night, I find my porch covered with dogs, and something should be done.

MR. TAYLOR: This gentleman has touched the danger line. The danger is to the sheep, to the horse, to the cattle and to the children. In our village one Sabbath morning, a dog strayed out and went into the town and bit all the dogs; next he attacked the chickens, and then a little boy who tried to take him away. He was killed, and his head sent to Pittsburg, and they directed that all the animals he had bitten should be killed at once, and the boy sent away for treatment. In our little town we have sent away six persons for treatment in the last six months, and for the sake of our loved ones, our fathers, our mothers, our sisters and brothers and children, I think that some action should be taken. I think that you men who are in the Legislature, and who have been in this Board longer than I have, should be able to draft something that will do the work.

But the trouble in our section of the State is, that we can't find the owner of the dog. I have been a Justice of the Peace for a number of years, and I have known fifteen cases where they never reported the owner of the dog. We have talked with the people, but we have never found the dog that did the damage.

MR. BLYHOLDER: There is another phase to this question, to which this gentleman has just referred, and that is, to find the owner of the dog. I know that in the section of country from which I come the same trouble exists, to find the owner of the dog. The assessor comes along, and sees the dog, and he says "whose dog is that?" and the man says "I don't know who he belongs to," and that is the way in every house in the village. Now, I think the assessor should furnish a tag to every owner of a dog, and every dog found without a tag should be killed.

The SECRETARY: Should not that be the tax collector?

MR. BLYHOLDER: I also had a good many sheep killed by a dog, and the dog was never found. Now, I think the assessor should furnish the tag, and the owner be compelled to put it on in the presence of the assessor, and whenever a dog is found that has no tag on, he should be killed at once, right then and there. You know, in our district the tax collector does not come around any more; the tax is brought to him; so I don't see how he could do it. It seems to me that the assessor is the one who should do it, and he should furnish the tag, and have it put on in his presence, and every dog that is found without a tag should be killed at once. I had a very excellent sheep farm up to three years ago, but I had to sell off the farm and the sheep. The dogs made it simply impossible for me to keep them.

MR. BOND: Finding the owner by the dog; what good will that do, if you can't find the dog? I have a way of finding the dog and the owner; I know the dog, and then I catch him, and find the label. I have two on my hands now.

The CHAIRMAN: It seems to me we should not discriminate in favor of the dog. I have a horse, and I must take care of him; I am not supposed to let him roam around all over my neighbor's property. Why, a dog has more privileges than you or I have. If I go on my neighbor's property, I make myself liable to an action for trespass. If a man wants to keep a dog, let him keep him in, and not allow him to run around, biting people and stock.

MR. CLARK: I think I can agree with both Brother Bond about identifying the dog, and with Brother Blyholder about identifying the tag.

MR. HUTCHISON: There is a gentleman here from York State; they have a local law there in his county, on which I would like to hear from him.

MR. VAN ALSTYNE: I did not want to get into this discussion, although I have been an interested listener to it. We have a local law, that is just going into effect, and it requires that during this

present month of January every owner of dogs shall apply to the town clerk, and register his dog, with the discription, and pay a fee of two dollars, and the town clerk then issues to him a tag with a number on it corresponding with the one entered into the book, and every dog that is not so recorded during this present month of January has no standing, and the owner who shall fail to register his dog is guilty of a misdemeanor, and may be imprisoned.

MR. NELSON: I want to say to Brother Blyholder that the resolution I have referred to, makes it obligatory upon the constables to report that they have killed all dogs found in their bailiwick without tags.

MR. VAN ALSTYNE: I might add that if a man fails to register his dog, he is liable to imprisonment, and his dog is killed. Now, the trouble in regard to having the constable kill the dog, is that the constable is generally a candidate for re-election, and does not care to go around killing his neighbor's dogs.

The CHAIRMAN: Why not let anybody do the killing, instead of forcing the constable to do it?

The SECRETARY: I move that a committee of three be appointed with Brother Clark as Chairman, to formulate a bill to be presented to the Legislative Committee for presentation to the Legislature.

Motion seconded and agreed to.

The CHAIRMAN: I will appoint on that committee Messrs. Clark, Blyholder and Critchfield.

The Committee appointed to await on the Governor reports progress. The Governor is very busy, and his whole time will be taken up to-day, but he has signified his willingness to be with us to-morrow morning at 10 o'clock.

The CHAIRMAN: We will hear from Mr. Van Alstyne on "Building up a Dairy Herd."

The following is the address:

BUILDING UP A DAIRY HERD.

BY MR. EDWARD VAN ALSTYNE, *Denmark, N. Y.*

I want to talk to you in a very practical way, to, I presume, a company of very practical men. I suppose the aim of this address is that we may obtain a more profitable cow in our dairy. And in what I have to say to-day, as well as to-morrow, I wish you to understand that it is not to the wealthy man, the man with unlimited

means at his command to purchase the very best that money can buy, that I am talking; he is not the man I have in view at all; he is a very popular factor in society, but the man whose every wish is obtainable is not the man I have in sight. It is the ordinary man, like myself. I say this because I think it will be best for us to clearly understand one another

I think that we to-day want a better dairy cow than ever before. I say that, because I fear in many instances the farmer is keeping his cows with but little profit. What is the profit on the dairy cow? Is it that she simply pays for her keep, and makes a minimum of profit? That is not going to pay off the mortgage, and clothe the children, on the farm. The first thing we expect of a cow is that she will pay interest on the money invested in her. If we take three or five hundred dollars to the savings bank, we get three and one-half per cent. interest, without the trouble of working for it. If we put it out at interest, we get from five to six per cent.; as you increase the risk, you increase the interest. When we invest it in a cow, three and one-half per cent. is not enough, nor five, nor six per cent., because we are not sure that we can get it back when we want it. I find that in a herd of twenty-five cows it is necessary to replace at least five each year to keep the herd in good condition. Some of them may go barren, and some of them may lose part of the udder, one may die. So I figure that on the money invested in the Dairy Cow, I should have at least ten per cent. to equal the interest on the same amount of money invested elsewhere. So if we pay fifty dollars for the cow we should have at least five dollars profit on her. The next practical thought is her feed. As I said before, she should pay for her keep before we begin to make any profit on her. And the labor; what does it cost to milk her three hundred days in the year, Sundays and holidays included? At least ten dollars more on that. So I figure that I must have at least ten dollars over and above the cost of her feed, and the interest on the money invested in her, before I begin to make money on her.

Now, we have to have a better dairy cow, and I am very sure that it is not of any particular breed. A man starts out thinking he is going to make money right out of this particular breed, or that one. Now, let me say that each particular breed have their use for special purposes. I want to make myself clear on this point, because you may infer from what I say later on, that I am not a believer in pure bred cattle for the ordinary man. Yet I am a most firm believer. I believe firmly that all the best things we have in our dairy herd to-day are the result of careful breeding. We will take the superb Holstein, which for two thousand years has been bred in Freisland, Holland, where she is given a large amount of rather bulky feed, with a view to producing large quantities of milk, without reference to quality, and in which purpose they have succeeded. The Holstein will produce a quart of milk—regardless of its interest—on the feed given her cheaper than any other cow. Then we will take the Jerseys and Guernseys, bred on the rocky Channel Islands, milk high in fat and other solids and yellow, more scant in quantity than is that of the Holstein. They have been bred not so much to produce a large quantity of milk, as to produce one high in fat with a large globule, easily churned when made into butter. They have

succeeded in that as the Holstein breeders have succeeded in their object. The Channel Island cattle produce a pound of butter cheaper than any other cows on earth. Not only because she produces butter cheaper, but because she produces a better butter. That is where many have fallen down. At the Buffalo Exposition it cost for food, for the Holstein cattle to make a pound of butter, about twelve cents. The Channel Island cattle, butter for food costs about nine cents. You can't improve on the cream or butter of the Channel Island cattle, because they are bred for that purpose. I will illustrate this: Those of you who were at the Exposition will remember that we had a small dairy-room which was often at a temperature of seventy degrees. On those hot days we took the cream from any other breed than the Channel Island cattle, and churned it at 60 degrees, we had grease pure and simple. We had to take such cream and reduce it to a temperature of forty, and then churn it for two hours, before we had butter, and then we often had to set the butter away for twenty-four hours before it was hard enough to print. We could take the cream from the Channel Island cattle, churn it at between fifty and sixty, take it out of the churn and print it and set it up on the form no matter what the temperature. Therefore I say that the Holstein is not the cow for the man who wants to make butter for market. The man who wants rich milk or who wants to make butter is a very foolish man if he attempts to make it from any other breed than those bred for that purpose. But there is a cow between the two, the Ayrshire, from Ayr, in Scotland, where they have not so much feed to give her, and she has had to hustle for her living. She gives a large supply of milk, with about four per cent. fat. For the man who wants a good milk, and fair quality, where the feed supply is not abundant the Ayrshire is the cow. Again the man who wants to make beef is very foolish if he attempts to make it from any other breed than those bred for that purpose, such as the Shorthorns or Hereford. You see I am not a believer in the dual purpose cow. You say you want a cow on which you can make a little on the milk, a little on the butter, and a little on the carcass, but you can't do that and not lose in every respect. I will take for illustration, the Holstein, the extreme dairy breed, and the Hereford or Shorthorn, the extreme beef breed. We will put both on the market, both equally well fed, and weighing the same, and the Hereford will bring from one-half cent to one cent per pound more than the other. Why? Because the Holstein is developed in the lower portion of the body and the other up where the cuts are worth the least, in the back and loins. Again, the man who attempts to use the beef cow in the dairy, is as foolish as the man who would hunt birds with a bull dog. Get cows of the type that will fit your needs. "I thought," you will say, "you said you were going to talk to the average farmer, and now you tell us to go to an importer and buy our stock." Yes, if you have plenty of money which most of us haven't.

We have come to the point where most of us realize that we must have a better dairy cow, and that a cow that has been bred for a particular purpose. What shall we do? We go to a man who has good pure bred cows for sale, and select some that we think will answer our purpose and find that they will cost from one hundred

and fifty to two hundred and fifty dollars each, and we can't afford to take them. The animals are worth it, but we simply can't afford to pay the price. What then? We have our heads set on pure bred stock, and we go down the line until we find something that fits our pocketbook, and we say "these are pure bred?" And they answer "Oh, yes." "They are registered?" "O, yes." And we buy them, and take home the man's culls. He wouldn't have sold them at that price if they had not been culls.

I repeat that these animals have been bred for the particular purpose for which we want them. When we have made up our minds we want a large supply of milk, and have plenty of feed, then we take the Holstein; if butter, then we take the Channel Island cattle; if better milk, and hilly pastures, then we take the Ayrshire, and if meat, then we take the Hereford or Shorthorn. A good cow is cheaper at sixty dollars than a poor one is at ten. I am going to describe the requirements of a good cow a little later. With the best grade of the particular type desired, we will get a bull of the breed we want. Let me emphasize the importance of a good bull. The importance of pure breed. I don't think we emphasize that as we should. When we consider the breeding of animals, the strain of the sire should be very carefully noted. Why, gentlemen, what is a pure bred animal? It is simply one that has been bred in a certain line so long that the type has become fixed. There is always a tendency to go back to the characteristics of the ancestors, and the better these characteristics and the longer they have been bred, the nearer we get to the animals that we want, and the more certain we are of producing the tendencies of that line. The more we breed, indiscriminately, the more likely we are to go back to the original tendencies. To illustrate this, let us take the human family, and go right back to the Jew. Since the days when Abraham went out from Ur of Chaldea and went whither he knew not, down through the centuries, there has been the Jew, and to-day when for more than two thousand years he has had no country, he is as separate and distinct as he was four thousand years ago in Palestine. You can pick him out to-day by his facial characteristics, and by the same characteristics which Jacob exhibited when he entered into that cattle deal with Laban, and in Joseph, when he got up that corner in grain. Scan their names; you will find them foremost in finance, in music, in trade and in politics. They are masters in whatever they undertake. Why does the Jew succeed in spite of the persecution he has endured? Because he is smarter than the other fellow. It is just this: The marriage of Jew with Jew, the breeding of the racial characteristics, until we know to a certainty when we see a Jewish family, that the child is going to be the same Jew that his parents are.

And this is the way our type of domestic animals is fixed. You will buy a sire of the best breed. I believe it is more necessary for me to have a good sire in my herd of grades, with his breeding capacity proven, than it is for my neighbor, who is breeding pure breeds entirely. He has a pure blood in his cows. You get a grade sire, the descendant of pure breed on one side, and of anything on the other; you breed him with a good cow, and you say he will reproduce the traits of his pure breeding; how do you know this?

There is always a tendency to go back to the traits of the ancestors, but how do you know he will not reproduce the bad traits, instead of the good ones? He is just as likely to do so.

Then comes the cross-bred, the result of breeding two pure breeds together. For instance, I will take a Holstein that gives plenty of milk, but it is not rich, and I will breed him with a Jersey who has plenty of richness, but not so much milk, and then I will have the excellencies of the two? What is the result? I get the quantity of the Jersey and the richness of the Holstein. It is the old story of avatism, the going back to the original tendencies of the ancestors. Darwin in his "Origin of Species" claimed this, and made the statement that all breeds of pigeons could be traced back to the old Blue Mediterranean pigeon. To prove it, he crossed the Pouter and the Fan Tail and what did he get but the blue tail feathers of the Mediterranean pigeon. We see the same thing in our cross breeding. When we bring together two pure breeds, we increase, for some unknown reason, the tendency to get the bad qualities of both lines. I can bring that right down to you. It is not the simon pure negro that causes the most trouble; it is the mulatto, who developes the worst traits of both his black and white ancestors. We have the same thing in the Indian. Up in New York, we have not many Indians, but we still have a few, who are a conglomeration of the old Six Nations mixed with whites, combining the evil traits of the white blood in them, with the same traits of their red blood. They are the laziest and most shiftless beings on earth. They won't work if they can beg or steal. I could not help, at the Exposition, but compare them with the real simon-pure Indian of the plains. You know they had an Indian village there. These were dignified, a fine type of pure breeding, the other, the evil product of the two races. Perhaps I am spending too much time on this, but I realize the importance of it.

We had first the grade sire, then the cross-bred sire, but what we want is a pure sire. So we get one, and use him with the herd, and if his calves are what they should be, and he proves to be a good animal, we will keep him just so long as he is serviceable. There is more deterioration to be laid to the yearling than from most any other cause. We want the strength and the stamina of fully matured ancestors. I prefer to have a bull eight or nine years old; I never know just what he is going to do until he is four years old. I sacrificed one of the best bulls that I ever had when he was three years old, and never knew it until his daughters came to milk. So I have learned to keep my sires just as long as they are serviceable. With grades, I would use a bull with his daughters. You will say that is incestuous breeding. That is true, but when we bring these two lines of blood together we get three-quarters of the line-blood that we want. If there are no weakness in either sire or dam there will be little to fear from such a course. And when we buy again, buy a bull that is bred along that line. That is where many a farmer makes a fearful mistake; he would like a little more size, so he takes another breed to get it; he would like a little more butter so he goes to the Jerseys to get it, and perhaps he would like a little more beef, so he goes to the Hereford to get it. He is like the woodchoppers; they were Canucks, their work was cold, and

they generally wanted a little something to warm them up. On one occasion they tried to tell the landlord at the tavern what they wanted; they didn't know the name, so the Canuck said: "You take a little whiskey to make it strong, and a little water to make it weak; a little lemon to make it sour, and a little sugar to make it sweet." "Oh," said the landlord, "that is a flip." And so it is with our farmer. You get a little Holstein for the milk, and a little Jersey for the cream, and a little Shorthorn for the beef, and you have a "flip" every time, and if I want to see poor cattle, I will go to the place where they have followed this course.

When I went into breeding, I raised all my heifer calves. But there was something wrong; I didn't get results; so I said 'I will have to be more careful,' and I selected them only from the best cows, and I got nearer what I wanted, but I still drew a good many blanks, until I began to examine the calves themselves. Now it is a fact that a good many heifer calves fail to be as good as their dams. Do you ever think how much we ask of the dairy cow? We ask her in twelve months to support herself, to reproduce herself, and give us an amount of milk often equal to the weight of her body. Now, I have begun to examine my calves, and I find a calf that is weak, and anemic, I don't try to raise it, and this you can tell by looking at the calf. Open its mouth, and look at its teeth, and if you find only four of the milk teeth, that calf is not worth raising. Why? That mother had too much of a strain on her, and she was not able to put strength and stamina into the calf she was raising. I have raised some of these calves, and they have always been a disappointment. Then I examined the udder, and the teats; one of the tests of a good udder is to have the teats placed right. This fall I was a judge at a fair up in my state, and a man brought in a heifer. She was a fine Jersey, and I thought "that is a prize winner, sure," until I examined her udder and found two of the teats joined together. I asked him why he raised her, and he said he had never looked at that; he had never seen it.

Now, when a calf passes muster, then we keep it, but do not forget that their value as cows will depend largely upon their treatment for the first two years. They must be well cared for. After the first few months it is better to turn them out and let them work a little for their feed; it helps to develop them. They should have a large stomach, for it shows great storage capacity, even if it makes them appear pot-bellied. They must have a place where to carry the feed. I was at Moorestown, New Jersey, last winter, to see a herd of cattle that were large producers. I saw nothing abnormal about the cows except that they all seemed unusually large, and that many of the two-year old heifers were larger than those two and a half and three years old as usually seen of that breed. I could not understand it until they told me that they fed those calves on milk until they were a year old.

Now, then, we have selected our stock, and are breeding along that line year after year. We have found what we want, and we will go on breeding along that line, and in ten or twelve years we will have a herd that is nearly equal to pure bred. They are really pure bred, only they can't be registered. When we are adding to

our stock we will get in one or two good pure bred females, and at the end of ten or twelve years we will have a herd of fine, pure bred stock, and when we come to sell them we can get better prices for them.

Now, all good cows have certain points. What are they? To show them I have had the picture made. It is a very fair picture of a good grade cow I had. First, let us see the characteristics of the cow of way back. Now, the cow that Adam had after he left horticulture, was not much of a cow. What was she? Well, she was fitted for her work. She had to live out in the jungle, and fight for her existence with the wild beasts, and it was a case of the survival of the fittest. She had to fight her way through the heavy brush and overhanging trees. Let us see her characteristics: A small barrel, for she had only what food she found closed ribbed for protection; a small udder; a short neck and heavy horns, characteristic of the fighter. We should call that a very sorry cow, but she was probably the best suited to the times and her environment. Now, as to the points of the good cow: We can not fail to be impressed by her girth through here (the body), by the large nostril, and bright eye. The animal that has a prominent and snappy bright eye is the one that is likely to have a good constitution. The large wide nostril means a good pair of lungs; and a heart that is doing its duty. Then we have the thin head, with light horn, and prominent, pointed shoulder; the sharp, not flat back, widespread at the haunch, to insure easy delivery of the calf; ribs well set; high pelvic arch, long tail. What has the tail to do with it? Only this, that the tail is the extension of the spinal column, and a long tail indicates strong nerve force.

We can just as well breed good udders and easy milkers as the contrary. I have to-day descendants of the fourth generation of easy milking cow, and they have all more or less of her tendencies. Then I have two or three heifers descended from a cow that was not an easy milker, and I don't raise any more of them. Life is too short.

Then comes a large, crooked, milk vein. Some people are rather inclined to ridicule that, but I have found it a good test. It shows the flow of blood from the udder to the heart. Now, when there is not much milk, there is not much blood there. What I lay most stress on is the hole in the end of it; if the hole is large, it indicates that it is built to carry plenty of blood. We will probably find this larger on the left side than on the right. These are always things that are present in a good dairy cow, and they are characteristic of a good dairy cow. We find the same characteristics in the sire.

I want the head and the neck to be thin. I want him to have the same arched spine, and the same contour here as in the cow, and I want to find four good, rudimentary teats in the sire, which are well placed. I lay great stress on their being placed, because the sire reproduces himself, and you will find four times out of five that the teats of the heifer are much the same as the rudimentary teats of the sire. Then I like to see a good milk vein. Then I take the loose skin at the flank and stretch it; if it stretches out long and flexible, it is a good indication of the udder on his heifers. I was judging at a fair up in Washington County, my state, and there was a farmer there who was in the habit of carrying off the prizes each year, and

I gave him a premium for one or two of his cows, but none for his heifers, and none for his sire. He came to me and said, "I wish you would tell me why you turned down my bull and my heifers;" well, we brought out the bull; I could not find in him any of the rudimentary lines. He said he never knew of the existence of anything like that. Then we looked at the heifers; not one of them had an udder bigger than a sheep, and he said he was disappointed in them, but didn't know the reason. He didn't take offense at being turned down, but declared his intention of trying to breed along the lines I had pointed out to him. In this case, the sire had simply reproduced himself.

I want a good bull with good ancestry; the best I can get; but when we get to a place where we must choose between a bull with a good registered ancestry of performances and is not himself a good specimen, and one who is a good individual, I would rather have the bull that has the record of performance every time than the one with no known ancestry, but a good individual. Keep a record of his milk strain and breed from that. Give me a bull with an ancestry of producers, and he will produce himself in his descendants.

Given these things, I know we can develop a herd of better quality, and better producers than we can in any other way.

The CHAIRMAN: We might devote a few minutes to the discussion of Mr. Van Alstyne's address.

MR. RODGERS: What effect would it have on the cream where a farmer keeps one-half Holstein and one-half Jersey cows. Would it churn together properly?

MR. VAN ALSTYNE: Yes; there would not be so much loss if separated by machine. Of course we know that cream passes in the separator as rapidly as the gravity allows, and the butter globules would not be mixed with those of the Jersey, and it would not turn out quite so rich. And there is another point: what makes a good ration for the Holstein will not make a good ration for the Jersey. So I would rather have them one grade. Now, a man may have to keep a Holstein and a Jersey if he sells the milk, to make it a little rich. I have heard people say that the butter of the Holstein was of excellent flavor, while that of the Jersey was not so ideally flavored. That is not so at all. It is due to the feed, and to the manipulation of the cream.

MR. McCREARY: A yellow skin on the animal, would that count in its favor?

MR. VAN ALSTYNE: A yellow skin on a Holstein as well as on any other animal will be a good indication that there is some butter fat there, but it is not always a sure indication. Now, for instance, the Guernsey cream is more highly colored than that of the Jersey, yet the Jersey has the richer skin, but has not, consequently, the richer cream. A better way, I have found, is to turn back the ears, and if they are oily, and to look again at the shoulder, and again at

the end of the tail, and if you find there an oily substance, the milk will be pretty sure to be rich in butter fat.

The CHAIRMAN: Do you consider the Ayrshire a good dairy cow?

MR. VAN ALSTYNE: Yes, I do. When a man wants a cream of $4\frac{1}{2}$ per cent., or a little better, present, I believe that the Ayrshire is better for that purpose than any other, but it seems to me that she is not as highly appreciated as she should be. I suppose the reason for that is that she has been a good cow, and they have been satisfied to keep her, and not attempt to put her to the front.

MR. HERR: Is it not one objection to the Ayrshire that her teats are very slender, making her hard to milk?

MR. VAN ALSTYNE: Well, yes; the Ayrshire in Scotland is milked by the women, and time is not valued, so that the teats are very slender, but in the last ten years her teats have been very much improved.

MR. SNAVELY: Is not the Ayrshire coming to the front during the last few years?

MR. VAN ALSTYNE: I want to say this; and I don't want any one to think I am opposed to the Holstein, because I think the Holstein is the best cow in the country to-day, but I have seen a good many indications in our country, where they make cheese to a large extent, that would seem to show that the Holstein is taking second place. I should be sorry to see it, but just as sure as the sun rises to-morrow morning, in a few years you will see the Ayrshire displacing the Holstein in our country.

MR. CHUBBUCK: How about the Brown Swiss? She is a good cow, and some of my friends here are perhaps aware of it; she gives as much milk as the Holstein, and nearly as rich as the Jersey, and has a heavy carcass. I don't believe in going abroad, when you have your choice of the best at home.

MR. HERR: I should like to say that if there are any other credentials, I should be glad to have you hand them in now.

The SECRETARY: Prof. Van Norman wants to make an announcement.

PROF. VAN NORMAN: I merely wish to say that we have about completed arrangements for the demonstration of our milking machine. The cows are here, and we will have a demonstration at eight this evening, at ten to-morrow morning, and at four to-morrow afternoon.

MR. FENSTERMAKER: Will it not be possible to get off some more of the reports? There will be a fearful amount of ground to cover to-morrow.

MR. SEXTON: I move that we adjourn.

Properly seconded, and was agreed to.

Tuesday, January 22, 7:30 P. M.

The evening session opened with Vice President S. M. McHenry in the Chair.

The CHAIRMAN: Is Prof. Cochran of West Chester here?

The SECRETARY: I have not seen him to-day, and don't think he is here.

The CHAIRMAN: Next in order is the report of Dr. Groff; is he here?

The SECRETARY: Dr. Groff is not here, but his report is, and can be read, or received and placed on file, as desired.

It was moved and seconded that the report be received and placed on file, for publication with the other reports.

Agreed to.

The report is as follows:

REPORT OF HYGIENIST.

BY DR. GEO. G. GROFF, *Lewisburg, Pa.*

Tuberculosis, Typhoid Fever, and Cancer are the three germ diseases which now claim the greatest number of victims in our State. Beyond a doubt, all are communicable from person to person.

Tuberculosis is common to man and many of the lower animals, though it is doubtful if it is often communicated to man from these lower animals. The reason of this seems to be, that the temperature of the common domestic animals is higher than in man, so that when the germs find their way into the human body, they fail to live and multiply in the lower temperature of the human body. The cow, sheep, hog and poultry are all subject to Tuberculosis, and any animal known to be affected, should not be used for human food, and in the case of affected cows, they should not be kept in dairies, but should be removed and killed.

Whenever an inmate of a family is stricken with this dread disease, or whenever any signs of the disease appear, an outdoor life should at once be entered upon. Such person should live out of doors day and night. He should get all the fresh air, milk and eggs possible in the twenty-four hours. The germs of the disease are eating his body up. The air, milk and eggs are prescribed in order, if possible, that they may build up the body, more rapidly than the germs destroy it, and sometimes the treatment succeeds. There is almost no use to use medicine for the disease. Care should be taken that no one else in the family takes the disease from the sick person. He should never spit upon the ground or upon a floor, but into a

paper napkin which should be burned. The ordinary handkerchief is dangerous is used to receive the sputum. One sick with tuberculosis should not be employed in the dairy, for he may infect the milk with his hands, or the straw of the stable with his sputum, which when dried, may get into the milk, where the germs live and multiply. The tubercular patient should have his own dishes, which should be washed separately from the other dishes of the family, and articles of food which he does not eat, should be burned, or buried deeply in the ground. After a death from tuberculosis, the room and all that belonged to the patient should be most thoroughly disinfected. The sick-room should be exposed to the air and sunshine so long as possible before it is again used.

People do not inherit tuberculosis. They may inherit constitutions which are susceptible to that disease, and so we often see several cases in the same family; not because the disease has been inherited, but because it has been communicated by the first case to the others.

Typhoid fever is also a germ disease, communicated most commonly through food and drink. These become contaminated and infected by more or less carelessness. Thus, faecal matter is too often allowed to enter water which may be used for domestic purposes. Sewers commonly discharge into streams which lower down are used for drinking purposes. Privies are generally too near wells, and often on higher ground, so that it is entirely possible for drainage on the surface, or underground, to exist directly in the well or spring. If the discharges from a typhoid fever patient enter drinking water, it is almost certain that some of those who use the water will contract the disease. If such water is introduced into milk, the disease may be in that way spread, for these germ flourish in that fluid. A person suffering from a mild form of typhoid fever, may, in milking or in cleansing the utensils in a dairy, infect the milk, and epidemics have originated in this manner. Nurses, in handling the sick, have their hands infected and unless they are very careful, they will infect food and drink. The person who nurses one sick with typhoid fever, should not, if possible, cook for the family. Every time she handles the patient, she should most carefully wash her hands. One sleeping with a patient with typhoid fever, may readily contract it. So, also, if there is carelessness in a family with the discharge from a sick person, the germs may get into the house, dry up, spread about, and many persons come down with the fever. With the utmost care, the disease can be confined to the person who first takes it. There is no need to quarantine a house with typhoid fever, and there is no need to keep the children home from school. It is well to tie the pump handle, when, in the country, a funeral occurs from typhoid fever. The water is dangerous to use. It should all be pumped out, a pound of copper sulphate thrown into the well, left there for a day, and the well again pumped dry.

Cancer has become one of our most prevalent diseases, as well as one of the most fatal. There is no idea that it is inherited, but it distinctly follows in certain families, for the same reason that tuberculosis does. There is no proof at all existing, that any foods, animal or vegetable, in any way cause cancer. Cancer has been ob-

served in the eye and salivary glands of the cow, and in trout in propagating tanks, and in rats and mice, in the latter in the mammary glands.

From studies recently made in the State Cancer Hospital, Buffalo, New York, it would seem that beyond a doubt, rat and mice cages may become infected with cancer, healthy animals placed in such cages contracting the cancer. This would lead to the inference that rooms in which cancerous patients live may become infected, and so the disease may be spread. It would be well in all these cases to thoroughly disinfect all articles used by such patients, and on their death to most thoroughly cleanse and fumigate the room. A point brought out in the studies of cancer in rats, was, that one cage remained infected for a period of three years, no rats having been in it in all that time.

No germ has yet been discovered for cancer, but it is generally thought to be caused by a minute animal germ.

It is now generally recognized that the Grippe and ordinary "colds" are "catching." In the writer's family it has been noted now for a good many years, that if one member of the family has a "cold," one after another "catch" it. Sometimes, however, one or two members of the household escape. At the State Sanitaria for Tuberculosis, it has been observed that colds become epidemic. The same is frequently seen in schools. By exercising care with the sputa, these diseases may be restricted, possibly to those who first contract them.

The CHAIRMAN: Prof. Surface is next on the program. We shall now have the pleasure of listening to him.

PROF. SURFACE: Mr. Chairman, by a mistake I made this evening, I brought the report of the Ornithologist to-night. I have prepared some specimens of insects which I wish to use in the report on Entomology, and which I have not with me. If, therefore, there is no objection, I will give the report of the Ornithologist at this time instead of the report of the Entomologist.

The CHAIRMAN: If there is no objection on the part of the members present, we will listen to the report on Ornithology to-night, instead of the report on Entomology.

No objection being made, Prof. Surface read his report as follows:

REPORT OF THE ORNITHOLOGIST.

BY PROF. H. A. SURFACE, *Harrisburg, Pa.*

The past year has been one of unusual interest in certain features of bird life in Pennsylvania. In the beginning of the season for migration the Blue Bird came north early, and after their arrival snow came and remained on the ground until thousands of Blue Birds were starved, and the dead or dying remains of many were

found. This materially decreased the number of Blue Birds nesting in this State during the summer. Several reports sent us from Lancaster, Dauphin and other counties, concerning Black Birds picking large holes in growing English Walnuts before they were half grown. This did not appear to be for food, and the suggestion has been made by Mr. Gabriel Hiester, President of the State Horticultural Association, that it may have been to use the bitter juice of the English Walnut as an insecticide for their parasites, as he noticed them picking the walnuts and then preening their feathers.

Unusual complaints have been made against the English Sparrows, especially for their damage to peas growing in gardens, which they pulled as soon as they appeared above ground, and of which they also ate into the pod before the young peas were ready to pick. Much complaint has also reached us of English Sparrows eating the buds of fruit trees, and if legislation could abate this nuisance, we should be heartily in favor of it.

The statements have come to us that the Wild Pigeon has been several times in the northern and mountainous parts of this State, and we have a letter recently received upon this subject, stating that a wild pigeon was seen nesting on a stump last summer.

We wish to speak in some detail of the stomach contents of various species of birds that have been sent to the office of the Economic Zoologist during the past year. Among these are the following:

The Horned Grebe.—We have received and examined the contents of six specimens of Horned Grebe and have found sand and vegetable matter in practically all. In three there were fragments of Black Beetles, probably the so-called Whirligig Beetles, which live on the surface of the water.

The Blue-winged Teal.—A Blue-winged Teal was found to have fed upon aquatic snails or mollusks, seeds of *Polygonum* or smart-weed, and other weed seeds.

The American Black Scoter.—An American Black Scoter was found to contain a mussel-shell 5x2.5 centimeters, another small bivalve, and fragments of other bivalves, showing that it is decidedly a mollusk-eater.

The Coot or Mud-hen.—Several specimens of Coots were examined and all were found to contain white sand and vegetable fibres, while one had eaten a large number of small snails. However, the evidences are that it is to a great extent a feeder on aquatic vegetation.

The Bittern or Indian Hen.—The stomachs of two Bitterns were examined, one of which was empty, but the other contained one of the night-flying moths, the remains of a cricket, and the spines and fleshy tissue of a caterpillar, probably the destructive Woolly Bear larva. The stomach of this Bittern was lined with the bristles of such insect larva. This is a new and interesting point for the Bittern. It also contained the seed of Spanish Needles. Thus we see this aquatic bird, which is too often shot by gunners, is justly protected by the law.

The American Goshawk.—In the fall or early winter there was an unusual southward flight of the American Goshawk, or Blue Hen Hawk, which nests mostly northward and comes into this State only in the winter. Of four Goshawks examined we found the

stomachs of two contained feathers, probably of small birds, and one with chicken feathers. In fact, the last-named was caught by a steel trap set upon a chicken which it killed. This is one of the serious enemies of rabbits, ruffed grouse, quail, and domestic poultry, and is not protected by law in this State.

The Red-tailed Hawk.—There has been much discussion about the protection of the Red-tailed Hawk, as it is one of the birds that can not be killed legally at any time in Pennsylvania. This law is commonly violated, but we have seen enough to justify its preservation. For example, in one Red-tailed Hawk we found two red-legged grasshoppers, the head of a chipmunk, and two specimens of field mice. Another contained the upper and lower jaws of a field mouse, showing plainly that it was beneficial in its feeding habits.

The Red-shouldered Hawk.—This is another bird justly protected by law at all times. In the stomach of one was found a mass of hairs of a mouse, and in another were found two specimens of a short-tailed meadow mouse, or mole, and also a red-legged grasshopper. As this is the mouse that destroys trees by gnawing their bark to such an extent during the winter, and as the red-legged grasshoppers are the most destructive Pennsylvania insects of their Order, we can understand why the Red-shouldered Hawk should be preserved.

Cooper's Hawk.—In the stomach of one individual of this species we found the remains of a chipmunk and part of a small bird. In another was found a few small white feathers, showing that it had eaten a small bird, in another flesh and feathers of a chicken, showing that it was destroying poultry. This record does not entitle it to protection.

The Great-horned Owl.—In one Great-horned Owl we found feathers and bones of a chicken, and in fact, this bird was trapped when trying to get poultry. In another were the feathers of a small bird, giving evidence of the justice of the law permitting the Great-horned Owl to be killed at any time. However, we emphasize the point that there are at least eight species of Owls found in this State, and this is the only one than can legally be killed or captured.

The Screech-Owl.—In one Screech-Owl was found a spider and an insect, and in others were found mice and English Sparrows. This bird, and in fact, all the other owls but the Great-horned, should always be protected.

The Long-eared Owl.—One specimen was examined, and in its stomach was found the remains of three short-tailed meadow mice or moles.

The Barred Owl.—In a Barred Owl was found the Star-nosed Mole (*Condylura cristata*).

Ruffed Grouse.—A Ruffed Grouse had eaten a great abundance of sumac seed, also the red berries and seeds of the karonia, bitter-sweet, and wild smilax. Another was filled with the more common food of catkins or flower buds of the birch tree and hazel bush.

The Downy Woodpecker.—A Downy Woodpecker was found to have eaten two grubs, similar to the flat-headed borer of trees.

A Night-Hawk.—A Night-Hawk, No. 7619, was found to have sustained its good reputation as an insect eater by regaling itself on the following material: a Carabid or ground beetle, three clover-leaf beetles, (*Phytonomis Punctatus*), four Pentatomids or stink-

bugs, several kinds of ants, a grasshopper and other insects, which could not be determined by examination, because fragmentary.

The Common Crow.—Much interest should be taken in the careful study of the food of the crow. Since it is unprotected by law at any time in this State, persons can kill specimens and send them to us. We have requested many times specimens of crows and jays, killed at different times of the year, and from different portions of the State. We should like to have them in order to enable us to make complete studies of their food and thus prepare and publish a Bulletin upon this special topic.

We have found the crow feeding upon snails, beetles, clover-leaf beetles, red-legged grasshoppers, and other grasshoppers, Pentatomids, or stink bugs, insect chrysalids, flesh, (probably taken as a scavenger around a slaughter house or where butchering was done), and pumpkin and corn seeds.

On the whole, those that were examined were fully as beneficial as injurious, if not more so.

The Blue Jay.—Blue Jays were found to have fed upon the remains of beetles, snails, chestnuts, berry seeds, leaf-eating caterpillars, and probably corn. This shows the possibility of good from the feeding habits of the Blue Jay; we also admit that it indicates the chance of injurious work at certain times of the year if they should become very numerous in grain fields. Perhaps the worst that can be said about the Blue Jay is concerning its destructiveness of birds' eggs and young birds; yet it must be admitted that it eats many insects and young snails.

The Logger-head Shrike.—This is a southern bird, remaining with us during the summer time, and nesting in thorn bushes or bushes with spines, where it finds it convenient to pin insects, small birds, frogs, mice and other creatures, which it stores for future use. The particular specimen which was sent to us, No. 8486, was found to have eaten a spider, grasshoppers and caterpillars. This shows that the Shrike is a bird worthy of protection, and in our opinion, should be preserved at all times, and is justly protected by law in this State.

The Chickadee.—(*Parus atricapillus*.)—The Chickadee is one of our smallest and at the same time, most valuable birds. It remains in some portions of this State, particularly the northern part, all the year, and is found in this (central and southern) part of the State all winter. It feeds to a great extent on the eggs of plant lice, and other insects, and upon small chrysalids. This specimen examined had eaten a moth pupa about the size of the pupa of the Codling Moth, which is destroyed by these little birds.

The Tufted Titmouse.—This is a near relative of the Chickadee, belonging to the same family, and partaking of similar food. Specimen No. 8336, was found to have eaten twenty eggs of a bug belonging to the bed bug family (yet one of the plant-infesting species), and also a few seeds.

In conclusion, let us urge a closer study of the habits of birds, with a view of detecting and protecting those which are beneficial and destroying none until they are known to be harmful. Let us especially endeavor to preserve the Woodpeckers and Nut-hatches, also Chickadees and Titmouse by putting up old posts or logs in which they can nest; and other birds, such as Blue Hen, Wrens and Mar-

tins, by preparing nesting boxes or other favorite sites for them. Let us remember that the stray cat is a greater enemy to the birds, and thus also to the agriculturist, than the stray dog, and thus kill the superfluous cat by drowning or otherwise, rather than turn them loose in some lonely spot to kill birds or starve.

Let us realize that the greatest work to-day before the Naturalist who is working for the husbandman, is to learn what are the enemies of the obnoxious insects, which infest plants, and to teach how to preserve, or propagate these and thus insure living checks to the hordes of devastating creatures.

The CHAIRMAN: What shall be done with this report?

It was moved and duly seconded, and agreed to that this report be received and placed on file.

MR. HERR: The Committee on Credentials has a supplementary report to make: We have examined the Credentials of W. H. Stout, and J. L. Patterson, and recommend that they be admitted to membership in the Society.

It was moved and seconded that the above-named gentlemen be received as members. Agreed to.

The CHAIRMAN: Dr. Conard, whose report comes next on the program, is not with us just at this moment, so we will take up the discussion of the report we have just heard. By the time we are through, Dr. Conard will no doubt be in the room. Has any one any questions to ask Prof. Surface?

MR. FENSTERMAKER: If we put out feed for the birds that are beneficial, will we not encourage the English Sparrow? Will not he get the food so placed?

PROF. SURFACE: The English Sparrow is a grain-eating bird, and not much of a flesh-eater. The Chickadee and Titmouse are rather meat-eating birds, and it would be wise to put out a little meat or tallow for their use. If seeds were taken out they would attract the sparrow, but the tallow is not much of a temptation for him.

MR. BLYHOLDER: I would like to ask Prof. Surface what he would recommend to exterminate the English Sparrow?

PROF. SURFACE: If I could recommend anything to do that, I would gladly do it; I am of the opinion, however, that he is one of the evils that must be endured because it can't be cured. I have heard, though, that the best thing that has yet been found, is to give them seed which has been poisoned by strychnine. The poison should be disguised by mixing it with sugar. It is an experiment, however, that I have not tried, but I will probably have a report to give you next year on this matter. I would say, though, that great care must be taken with regard to poultry, so that they do not get the seed. I do not believe the bounty law will ever be a success. It has been tried at various places, and a bounty of three, four, and even five cents, paid for every bird that was killed; but by killing

one-half or three-quarters of them, it simply leaves more room for the others to thrive. Consequently, it does very little good, and only for one year, as they will increase the next.

DR. FUNK: Can't they be baited and trapped?

PROF. SURFACE: They are a very shy bird. It has been tried to trap them, and they succeeded once or twice, but afterwards the birds would stay away from there for weeks or for months. I think that one of the things we can do is to modify our architecture somewhat, so that they will not have any place to nest. Try doing away with the overhanging cornice, so as to make their nests accessible, when they can be reached and destroyed with the eggs before they are hatched.

The CHAIRMAN: If there is nothing further on this subject, we will take up the question of poultry, by Dr. Conard.

Dr. Conard then read his report as follows:

REPORT OF THE COMMITTEE ON POULTRY.

BY DR. M. E. CONARD, *Chairman*.

Not being a practical Poultryman, I feel a little out of place on this Committee; but will promise you that my paper shall possess one commendable feature—brevity.

In times past, the growing of poultry and the production of eggs has been a branch of agriculture that has too generally been classed as of minor importance and thought too small to demand the attention of the chief executive of the farm. But are we sure that it did not return a better percentage of profit than some of the so-called more important branches or departments of the farming operations?

Let us see what we receive for feed consumed by a flock of hens, as compared with an equal value fed for milk, beef, or pork. Is it not a fair comparison to consider that the grain ration of a good working dairy cow will equal in value the ration of forty hens? Then, allowing the cow to give six quarts of milk per day, sold at three and one-half cents per quart net, she will return \$81.65 per year, while the forty hens receiving the same value of food and care produce one and one-half dozen eggs daily—sold at twenty cents per dozen—aggregating for the year \$109.50; and, again, allowing the same value for food and labor to produce one and one-half pounds of beef or pork daily, sold at eight cents per pound, we would receive only \$41.80.

Statistics tell us that Pennsylvania's Poultry Yards yield from 15 to 20 millions of dollars' worth of product annually, and that the United States produced \$600,000,000 worth of poultry and eggs

during the past year, and Mr. T. E. Orr tells us, in his Bulletin No. 143, that Pennsylvania consumes five times as much poultry and eggs as she produces annually. Now, is there another farm product of such vast importance to our every meal, the traffic in which has reached such vast proportions, and yet falls far short of meeting the daily demand.

It is very certain that we, as farmers, are face to face with a good market for one of the best paying products that the land produces, and how many of us know it? Is it not time we were looking around and doing some figuring for ourselves, and not going on in the old ruts just because our neighbors do? There is a possibility of our not doing enough thinking for ourselves and not working out each for himself the possibilities of his own personal ability, location and surroundings.

For many reasons it would not be possible for us all to be successful in the poultry business; but it is possible for many to succeed better, supplying the market allowing from 75 to 100 per cent. more for a given amount of food and labor than the market they have. One dozen of eggs is a small matter, so is one pound of soap, one loaf of bread, one quart of milk, or one box of matches, and lots of other things that enter into our daily needs, and how many of these numerous necessities are produced as a side issue without the care of a capable owner or manager?

Nevertheless, the unassuming hen has produced as much value in the United States in the past year as the wheat crop, and more than the cow, and more than the combined earnings of the railroads, more than the receipts of the steel industry, and still she has not supplied the demand.

With many mechanical devices and improved methods of to-day that make it possible to multiply the possibilities of the small operator many times over, and a good market at his elbow, it would be very easy to double the output of the Pennsylvania Poultry Yard, and make the hen not a competitor of, but a leader in earning power, of all live-stock kept on the farm.

The CHAIRMAN: What shall be done with this report, gentlemen?

Moved and seconded that it be received, and placed on file.

Agreed to.

The CHAIRMAN: Has any one anything to say on this subject? We might devote a few minutes to its discussion.

MR. CLARK: I had a set of Wyandottes that produced 150 eggs a year each, which I sold at two cents a piece, or a total of \$75.00. Now a hundred hens will cost about the same outlay of money as one cow, and will bring in about three hundred dollars. If you get a cow for the same amount of money, you would not have anything like the same amount of profit from her that you would from the hens.

A Member: How many hens did you have in the set?

MR. CLARK: Twenty-five.

A Member: You had them in a pen?

MR. CLARK: Yes, and I would keep my hens in sets of twenty-five to a pen; they are easier attended to.

The CHAIRMAN: If there is nothing further on the subject, we will go on with our program. Is Prof. Cochran of West Chester present?

It appeared that Prof. Cochran was still absent.

The CHAIRMAN: Since Prof. Cochran is not present, what is the will of the Convention in regard to passing on to to-morrow's program?

The SECRETARY: I think we had better take up the question of Agricultural Education; that belongs to this evening's program.

The CHAIRMAN: I beg pardon; I didn't notice that that is the next thing on the program. Our next subject then, is Agricultural Education, and the first speaker is Dr. Hays, of Washington. Is he in the room?

It appeared that Dr. Hays was not in the room.

The SECRETARY: I am sure that Dr. Hays expected to be here, and open this discussion, and I am entirely at a loss to know why he is not here this evening.

The CHAIRMAN: Since the gentleman does not happen to be in the room, we will call on the next speaker, Prof. Van Norman of State College.

Prof. Van Norman then spoke as follows:

AGRICULTURAL EDUCATION, PART 1.

BY PROF. H. E. VAN NORMAN, *State College, Pa.*

I am very sorry that Dr. Hays is not present. I was waiting to hear him, so that I might get my cue from him.

Education is being recognized as something more than can be learned in the district school, and we are coming to understand, too, more and more, that the college man is not the only one who may get an education; we can not all go to college, but we are realizing that a larger part of our educational work must deal with commercial men, such as you and me, and older people who have gotten away from school. I propose, for the little time I occupy, to speak of some of the educational influences at work in our country, more particularly outside of our own State. The speaker who is to follow me may have something to say about these educational influences at work within, but I shall speak of those outside of Pennsylvania.

Most of you know that our agricultural colleges were established as a result of the land grant act of 1863. These colleges had not long been engaged in their work of trying to teach the principles of science which underlie successful farm practice, when it became apparent that there was not only need of a class of men who knew the science, its application to the art, and had ability to impart the knowledge to others, but there was need of much experimental investigation in order that many problems might be better understood. To meet this need Congress in 1887 passed the act that has given to every state in the Union an Experiment Station. In the beginning many of these stations were manned in part at least by men who had had no experience in the work they were to do. Is it any wonder that they found it difficult and that the farmer did not always approve of their work, impatient as he usually is for immediate "practical" results? Thanks to the farmers' institutes and other agencies the past few years has demonstrated that the Experiment Station has a useful place and the results of their work are becoming more and more apparent.

Not only are they showing us new truths, but they are helping to bring it to the attention of larger numbers of people, through the medium of cooperative or demonstration experiments conducted on the farms of private individuals in many parts of the several states.

In Canada they have several thousand men scattered throughout the country who are growing wheat, oats and crops of all kinds under the direction of the Central Experiment Station. The conclusions drawn from their work are published and distributed throughout the country.

Two results of this work are: first the good to the men who have done it under the direction of the Experiment Station. Second, any addition to the sum of our knowledge.

Most of us are not like the electric motor moving steadily on because of the constant pull of the unseen current, but we are rather like the gasoline engine with its noisy explosion every three or four revolutions of the wheel, increasing the speed which gradually lessens till the next charge is exploded; if the explosion fails to take place then the engine gradually comes to a stop. So with us, we need an explosion of some kind every now and then to keep us doing our best.

There is no reason why most of us might not be conducting some experiments on our farms that would add to our knowledge and increase the profits of our business, but we need the additional incentive of the "doing it for the Experiment Station" to induce us to keep the record of careful observations that are required to make the work most helpful.

In Illinois the Station hires the land needed in different localities and for a longer or shorter time conducts its experiments under the immediate supervision of its own trained men.

Indiana last year had some five hundred cooperative experiments in progress, nearly every county in the state having at least one or more.

They are of two classes: one in which a man from the Experiment Station goes to the outlying farm, selects a site to be planted, gives

directions for the work, and then when harvest time comes, he returns to help with the harvest, and note the results. This class of experiments are very helpful, because they are based on accurate observations. The next class is not so reliable, because they are carried out by men who the Station does not know, and it can not know how accurately the work may have been done. But in both instances they find the men on whose farms the work was done are very much interested, also the interest of the whole community is usually aroused. The neighboring farmers are apt to tell one another that "Bill Jones is carrying on one of those fool experiments from the college," and if he is successful, they become interested, and maybe next year three or four of them write and want to make experiments for themselves. This is a line of work that is growing very rapidly, and is particularly appreciated in the states where it has been taken up. I will not go further in this line, because there is too much ground to cover.

Illinois has led in getting its boys interested in the line of corn improvement. Then Indiana adopted the boy corn growers' movement. The statement was made in my hearing that in one county they had formerly produced an average of 33 bushels of corn to the acre. This year one hundred and forty boys, under eighteen years old, were each given an acre of ground in that county. These boys grew the corn under the general direction of a representative of the Experiment Station of that state. They selected the seed corn according to his directions, and planted it according to his directions, and what do you suppose was the average yield? Over 74 bushels of shelled corn to the acre, or about 140 bushels, according to the way you farmers count your corn. Yet the yield in that county before had averaged only 33 bushels to the acre!

Illinois is a great corn state, and they are interested in corn, as is shown by their experiments there, but our production is larger per acre than theirs. Illinois took up the question, and the boys took it up, and prizes were offered. The latest development is one that I want to lay special stress on. A representative of the Experiment Station told me he went to several bankers of the state. Why to the bankers? Because they are quick to see an opportunity to make an investment. He succeeded in getting them to offer a prize to the boys in the schools of the county who would make the best showing raising corn. What is the prize; five or ten dollars, which is forgotten almost as soon as received? No; it is a course in the State College of eight or ten weeks. There they meet other boys, and their interest is further aroused. Now, this action of the bankers succeeded in getting the farmers in some of the counties interested, and they say "we don't need the bankers to do that for our boys; we can do that ourselves," and they are offering their own prizes, and not only getting the boys interested, but are getting better farm work as a result.

The results of their work have been published and may be secured by those of you who wish to follow it up.

Let me refer now to a class of work in which I am especially interested: some of the extension work that is being done away from the college—away from the classic halls. At the late expo-

sition at St. Louis, Minnesota twice out of three times won the highest prize for the best tub of butter. It had the highest average of any state's exhibit of butter there, and you know how hard it is to get a high average on a large number of entries. How did they get that average? Minnesota keeps a dozen or more skilled butter-makers traveling among her creameries helping their operators to overcome the fault in their butter, and their exhibits at St. Louis with the long string of prizes showed the wisdom of this.

Canada has largely taken from the United States our foreign market for butter and cheese. That is for two reasons: We created a prejudice against our products by adulteration. Then Canada went out to supply the market. They have over thirty traveling instructors at work helping their factories make the kind of product the markets want. But the United States is waking up. Traveling instructors are at work in Illinois, Wisconsin, Minnesota, Michigan, Indiana, and to a slight extent in Ohio and New York; they are giving these instructions right where the men are who are doing the work.

Another thing is the special trains that have been run through the west, and later on in New England, where they stop at the different stations twenty minutes and have men on the train selected for the purpose, to give lectures. The train is well advertised ahead, and is on time so that the farmers who gather to see the demonstration and hear the lecture lose no time waiting. Many come, hear and are prompted to action who never go to the farmers institute. These trains do a lot of good work. The Pennsylvania Railroad, which most people think is not inclined to do anything for farmers, has made arrangements to run a special train of this kind over every mile of their road in the State of Indiana.

Then there is another educational feature—excursions to the college. Ontario was, I think, the first to develop the idea of farmers' excursions to the Experimental Stations. Their excursions bring in thousands of people in the course of a year. I have seen at the Michigan Agricultural College five thousand people on one occasion. Iowa runs excursions, and in two days last year 24,000 people visited the college and station. They look around the station, and they become interested in the experiments. You, who are here, are not so much in need of these things, but for every one of you who is here, there are ten, fifty, a hundred, or even hundreds, who do need them to arouse their interest and get them started on the way they should go.

Another influence for good, and I wish I had words to paint more clearly than is possible, the benefit of a great State Fair. I wish I could tell you of the great fair they hold each year in Chicago, and of the thousands of finely dressed, intelligent people who go there to see the magnificent display of fine animals on exhibition there—the cattle, and the horses that cost thousands of dollars a piece. The influence for good of an exhibition like this can not be measured. You go to these great shows, and look at these thorough-bred animals, and you say "these are all right for the rich man, but we farmer's can't expect to have them," and then you go out and see the carloads of steers that have been fed on the grain grown by this great grain-growing country of ours, and you see things that will

help you by sending you home with broader ideas. Then go in and see the students from fifteen or twenty of our Agricultural Colleges, with note-books in hand, judging the different specimens of cattle and horses, to develop their ability as judges. Then we come to the State Fair, where they are demonstrating butter making, and the Babcock test, hundreds of people stand there to listen and ask questions. And then we go out to look at the agricultural machinery, and see the number of people who come to these State Fairs to see the different makes of manure-spreaders, cement posts, silos, fences, and all the other modern implements for farm work. We must see these things for ourselves; we can't write all over the country to the different makers, and obtain any intelligent idea from their circulars, but we come to the State Fair, and listen to the salesmen, as they demonstrate the points of excellence of their particular make; we carry home a working idea. We know what we want when we are ready to buy. And I want to say right here that manufacturers are having to employ a better class of salesmen from year to year than formerly, because the farmers demand it. The growth of educational influences through our State Fairs has been very marked in the past few years.

These are some of the educational influences that are going on outside of our schools and colleges. Take this matter of our corn showing, for instance; there is not one of you who goes out and looks at the different kinds of corn that are shown there, but will profit by it even if you don't have anybody to point out to you the fact that very few of the ears have perfect butts or top. All of these things arouse your interest, and show you that there are very important educational influences at work around us, many of them in our own State. But another speaker will have more to say on that.

To sum up: Some of the educational influences at work in other states which we might consider with a view to adopting such as may be adapted to our conditions are:

Co-operative field experiments on many farms.

The boys' corn growing contests with a course at the Agricultural College as the prize for the successful contestant.

Traveling dairy instructors to help the butter makers and cheese makers, and to start cow testing associations.

Special dairy, corn, and good farming grains.

Excursions to the Agricultural College and Experiment Station.

The International Live Stock Show.

The National Dairy Show.

The State Fair.

The CHAIRMAN: I would again ask if Dr. Hays has entered the room since we have opened this discussion?

It appeared he had not come.

The CHAIRMAN: As Dr. Hays is not here, we will call on Mr. Bayard, of the "National Stockman and Farmer."

Thereupon Mr. Bayard read the following paper:

AGRICULTURAL EDUCATION, PART 2.

BY E. S. BAYARD, *Editor, National Stockman and Farmer, Pittsburg, Pa.*

It is a hard job for a man whose hair is burdened with hay seeds to tell you anything about this subject after such students of and experts in agricultural education have discussed it. What I shall say has especial bearing on the problem before us here in Pennsylvania, and I shall discuss only a part of that problem, for we have many branches of agricultural education—our Agricultural Department, our institutes, organizations, exhibits, papers, and our Experiment Station and College. None of these should or would interfere with each other were all developed to the limit of their possibilities.

It has been said that the chief need of agricultural education in this State is men and money. That statement, while broadly true, needs certain qualifications. A million of money and a hundred professors more mean little to our educational advancement if the people are not brought into contact with the educating influence. And this I believe to be the greatest problem before those who are studying agricultural education in Pennsylvania to-day.

It is a hard proposition, too, because the people can not be reached and interested without some outlay of money; and it is hard to get the money without having the people to back appropriation bills. We can not expect to do it all at once, but let us assume, as we have a right to assume, in view of what has been done, that the people are sufficiently interested to supply funds to begin the campaign. On what lines shall we proceed to secure the backing necessary for the development of agricultural education? Or in other words, how can we open avenues, and what avenues can we open, between the public and agricultural education that will lead to higher development of agriculture in this State? I propose to consider briefly a few things, some of them tried and tested, and others not.

APPEALS TO CONSUMERS.

* In the first place, we must remember that in Pennsylvania a large proportion of the people are consumers, and they must be interested as consumers. They are not interested as producers and the arguments that appeal to producers are lost on them. Thus their influence is not secured by our present methods of seeking support for agricultural education and it never will be secured by such methods. They must be reached by arguments that touch them as consumers. I fully believe that a campaign carried on through the daily press would secure for our agricultural educational institutions the support of many consumers. Pennsylvania has the best and highest markets in the world, and nobody knows how high they are as well as the consumer does or how inferior the quality of the shipped-in produce. He should be told the ad-

vantages in cheaper and better living which will result from a higher agricultural development in Pennsylvania, and if he is once convinced of the correctness of this idea he will support agricultural appropriation bills. And he should be shown, of course, that the State's attention to other industrial education has not been wanting—that agriculture is seeking no favors not granted to other occupations now and heretofore. It seems to me that a literary bureau to attend to the education of the consumer on this and other subjects, notably, the selection, care and use of agricultural products, would be a great boon to him, and ultimately to the producer also.

But, of course, the efforts to bring the people and agricultural education together must be devoted principally to those who are or will be actively engaged in some branch of agriculture. It has been found in other states that if these people can be made to realize the benefits of agricultural education they will provide the means, and it may be so in Pennsylvania. I present a few suggestions which I think may assist the people to see and support measures necessary in this State:

CO-OPERATIVE EXPERIMENTS.

have been found in some states, and notably in Ontario, Canada, a powerful means of advancing agriculture and interesting the people in agricultural education. Ontario has had over a thousand men and boys engaged in experiments under the direction of the Agricultural College at one time. The benefits are beyond computation to the boys and a greatly increased attendance at the college. It seems to me that Pennsylvania agriculture especially needs such a system. No state has a greater variety of soils, conditions of altitude and climate, and even of races of men, than Pennsylvania has; and nowhere could co-operative work be more useful to the people or the agricultural college.

EXTENSION LECTURES.

We have at the Pennsylvania Experiment Station (and State College) probably the oldest plots in this country on which experiments have been conducted continuously. The results of these years of treatment of land with different rations of plant food are known but not utilized. The figures may appear in bulletins, but they are almost a sealed book to the farmers of Pennsylvania so far as their practical value is concerned. Their lessons have not been interpreted. And if they were interpreted they could not be placed before the people of Pennsylvania in such a way that they would be of the highest value without a staff of men whose duty should be to present these and other lessons. There is need in the educational staff of Pennsylvania for men who might be called extension lecturers, to place before the farmers of the State the lessons which are taught by these and other investigations. Modern photography and the ability to reproduce photographs before audiences afford ample means of bringing these truths vividly before the people who need them. The farmers' institute furnish the audiences. Let the Department of Agriculture supply the

people, as it does now, and let the value of agricultural education, and the results of agricultural investigation, be placed before them by the College and Experiment Station. The cost of this work should not be great. The interpretations and the results should be secured anyhow, and the photographs and the men to elucidate them should not be expensive. Such work is a link between the people and the agricultural educational institutions which must benefit both parties directly and indirectly. In the same line is demonstration work, especially of such processes as in dairying which can be completed in a short time and the results known. All these lecturers and demonstrators can be legitimately used to bring men under the influence of the educational institution either in their every-day work or by actual attendance upon it. Such a connection between the College of Agriculture and the public is one of the first and greatest necessities in this State.

EXHIBITIONS.

Some years ago I looked upon the exhibition of the Ohio Experiment Station at the Ohio State Fair. I had to look for it in those days, and so did everybody else. But so many people found it and asked so many questions of the men in charge each year that the Experiment Station resolved to make a bigger show next year. Interest in this exhibit has so increased that the Station has now so much space in Horticultural Hall that other exhibitors are beginning to accuse it of monopoly. The people of Ohio are now asking, and no doubt will receive, an appropriation for a building on their State Fair Grounds for the special purpose of allowing the Experiment Station to bring before them some of the results secured in their investigations. I do not advocate a State Fair in Pennsylvania simply because we have no State Fair; but right here is seen the great need of one. And it should be demanded by the people of Pennsylvania for this reason as well as for many others. This State can afford millions for adornment and not a *sou* for a State Fair, which would be a profitable investment financially as well as otherwise. Let me read you a few extracts from letters which have been received in the past few days, and then you can see how thousands of farmers are reached in other states. We should be reaching them in the same way:

"C. D. Smith, Director.

"Michigan Experiment Station,

"Agricultural College, Mich.,

"Jan. 12, 1907.

"E. S. Bayard:

"Dear Sir: Our station exhibit has been carried forward at the state fair for many years. During the season of 1906 we made a special effort, through a special appropriation from the state. Outside of this special appropriation, the Experiment Station on its own initiative, made an exhibit at Detroit at the main state fair and at Grand Rapids at the West Michigan Fair. This exhibit consisted of about half an acre of ground planted to the cereals of economic importance or of supposed economic importance. For instance, any of the cereals that were unusual, or with which the farmers were not familiar, were planted there, like the pennisetums or the kaffir corn or some of the newer millets. So in the legumes we had rows of soy beans, of different types of cowpeas, Blac Murarau, and so down the whole line of legumes we tried to have representatives at the fair. * * * * I am here to report that the exhibit attracted a great deal of favorable comment and attention. It will be repeated on a larger scale next year.

"We made an exhibit of live stock not only at the State Fair, but at the West Michigan Fair and half a dozen other fairs, which were perhaps the largest in point of attendance of the county fairs. This was done under a special State appropriation for the purpose. We had pens of swine, illustrating the influence of different rations. We had cattle, not only fat cattle, but dairy cattle, dairy cattle with records, scrub cows, pure bred cows, and fattened animals. Naturally we had large placards over these animals giving the records and showing why they were exhibited. A scrub cow would have no place at a fair except to illustrate the advantages of the pure bred animal and this we did by means of charts, and the same way with sheep. Thousands of visitors viewed these pens and plots. We had men stationed about both places to answer questions, and possibly no more instructive feature was possible, at least none was presented at any fair which competed with our exhibit in value of the on-lookers.

"A third feature of our exhibit was made by the station and college jointly and consisted of pressed plants, yarn frames, model of a horse to illustrate the line of draft, corn to illustrate the different types, a large exhibit from the Women's Department, showing how sewing is taught and giving some specimens of the skill in needlework, views of the college, literature of the college, a very large fruit exhibit from the Experiment Station, three or four hundred plates of apples, grapes, peaches, with illustrations of spraying materials and methods of making spraying materials, exhibition of nozzles and methods of spraying, samples of the insect and fungous enemies of fruit plantations. This, in brief, is about the scope of our exhibit. I am very glad with you that the people of our State are much interested in the Experiment Station as is manifested by the fact that we have forty-three thousand names on our mailing list and that our list of students is gradually growing longer.

"Yours truly,

"(Signed) C. D. SMITH."

"Chas. E. Thorne, Director.

"Ohio Agricultural Experiment Station,

"Wooster, Ohio,

"Jan. 14, 1907.

"Mr. E. S. Bayard:

"Dear Sir: Replying to yours of the 10th inst., I would say that the exhibit of this Station at the Ohio State Fair has been a matter of evolution. When I took charge of the farm of the State University, in 1877, I began at once making small exhibits at the State Fair, the first exhibits being limited to samples of different varieties of wheat which were being grown on the University Farm. When the Experiment Station was established in 1882, it took up this work. I think that the college farm relinquished it at once entirely, or nearly so, to the Experiment Station at that time; then when the entire farm was turned over to the control of the Station the exhibits, of course, went with it. I believe they have been kept up continuously, with little or no intermission, since the period I have mentioned, and have grown from a little show, occupying 6 or 8 linear feet of space in one of the buildings of the fair to the one of last year, which extended around two sides of their great horticultural building occupying a total of 160 linear feet. I could only give the crudest estimate of the number of visitors which seek information at this exhibit, but during busy days of the fair for many years past there has been a constant stream of visitors passing for six or eight hours each day, many of whom stop to ask for information. In our first exhibits one or two men at most were amply sufficient to take care of the whole exhibit, but for the last two years almost the entire scientific staff of the Station has been present, with their assistants, and each man has been taxed to the limit of his physical strength to keep up the work.

"At the urgent solicitation of numerous county agricultural societies we have sent this exhibit to as many such as could be accommodated during the fair season. Last fall we chartered a freight car for this purpose, moving it from one fair to another during the season. I already have on file several applications for next season's exhibit.

"Yours truly,

"CHARLES E. THORNE,
Director."

"College of Agriculture and Agricultural Experiment Station,
"E. Davenport, Dean and Director.

"University of Illinois,
"Urbana, Ill., Jan. 16, 1907.

"Mr. E. S. Bayard:

"Dear Sir: In answer to your questions will say (1) the Illinois experiment station exhibited at the Illinois State Fair in 1899 for the first time; (2) the amount of space given to the station by the State Board of Agriculture is 40 feet square. We have had this space from the first time that we exhibited with-

out any change whatever. We did not, however, in our first exhibits fill all this space but allowed some other person, usually a representative of some farm paper, to occupy a portion of our allotted space. The past two or three years, however, we have filled our space entirely, and have wished for more. It is almost impossible for us to give an estimate of the number of visitors that seek information at the exhibit of the station. Some days there will be many more than on other days, and at some hours of the day they will be much more numerous than at others. It has been the privilege of the writer to have charge of the exhibit at the State Fair for a number of years, and during that time I have known the space to be practically crowded with people seeking information and examining the exhibits, so much so that we have had hundreds in two or three hours. Usually we find the largest numbers seeking information will come from 10 to 12 in the morning, and from 1.30 to 4 in the afternoon. Aside from these hours it is seldom that we have any visitors seeking information unless it has been some one who had been there before, and failed to secure the information he desired. It is not always the men that go to the exhibit for information, but many ladies as well * * *

"Our State Fair exhibit is becoming more popular, and is attracting greater attention each year, inasmuch as we are attempting to show the results of our soil and crop work in detail there. We have the experiment farm located here at Urbana, represented in miniature, with the crops growing on the different plots even as they would be seen here at the station. Together with this we have a statement for a number of years back, giving the yields, crops grown, effect of fertilizers, if any, etc. We have also in other portions of state, other than here at Urbana, crop production fields, one at Fairfield, Wayne county, one at DeKalb, DeKalb county, and one at Sibley, Ford county. This coming fall will complete three years' work on the field at Fairfield, Wayne county. Therefore we shall include in our exhibit a miniature reproduction of the Fairfield field with the crops growing upon the different plots even as they would be seen there. This will crowd to some extent our space, but we feel confident that the interest shown and the information given in this way is of sufficient value to warrant the crowding of our exhibit quite materially.

"Trusting that this will be satisfactory to you, and will be of service to you, I am,

"Very truly yours

"(Signed) O. D. CENTER."

"University of Wisconsin,
"Agricultural Experiment Station,
"Madison, Wis., January 17, 1907.

"Mr. E. S. Bayard:

"My Dear Sir: Yours of recent date to hand, and I note what you say regarding the exhibit at the State Fair. The Wisconsin Agricultural Experiment Association made this exhibit for the first time this year. We used a booth about thirty feet in width and about twenty in depth. * * *

"At the International Live Stock Exposition we made an exhibit from the College of Agriculture, using about sixty feet of wall space. We also showed a part of the Wisconsin Experiment Association Exhibit at this exhibit.

"At both places there were so many thousand people visiting our exhibit and listened to talks concerning various phases of the exhibit that it would be very hard for me to make any estimate of the number. Our exhibits at both places were well received by the directors and by the people in general.

"I feel that the Wisconsin Experiment Association is doing a great good for the farmers of Wisconsin. The organization was effected in 1901 and has now a membership of practically (paid-up) one thousand. The membership is scattered so widely over our state that they place before many farmers in Wisconsin demonstrations that can be done with pure-bred seed grains and forage plants. * * *

"Sincerely yours,

"R. A. MOORE."

LOCAL EXHIBITIONS.

If Pennsylvania has not a State Fair, it has many local fairs. Why could not exhibits and lecturers or expounders be utilized at these fairs? A few more exhibits must be provided for, and a few more men used; but by properly arranged circuits a few exhibits could be made to cover in a few years the entire State at comparatively small expense. But it takes two parties to make satis

factory arrangements of this kind. The State has no right to say to these local fairs that its exhibits shall be given room, or that a part of the expense shall be borne. I have therefore written to several of the local fairs in various parts of the State to secure a few expressions from them. Here are a few of them:

"The Great 1907 Pulaski Fair.
"Pulaski, Pa., January 14, 1907.

"Mr. E. S. Bayard, Sec'y, Pittsburg, Pa.:

"Dear Sir: Replying to yours of the 10th inst., will say that in my opinion the Experiment Station Exhibit you mention would be of a very great use in the locality, not only as an educator, but as an exhibit of interest to all the farmers of this community, and would most certainly draw as an attraction, and to say our Association would be willing to give space, I can assure you of that being done in Agricultural Hall, and I feel certain that we would defray traveling expenses and hotel accommodations to the manager, if not exorbitant, which I know they would not be. I will confer with the board in a day or two, and will write you more fully as to this last matter.

"Very truly yours,

"JAMES S. WOOD,
"Sec'y."

"Union Agricultural Association.
"Burgettstown, Pa., Jan. 12, 1907.

"E. S. Bayard, Sec'y, Pittsburg, Pa.:

"My Dear Sir: Replying to your communication, coming from you as Sec'y of the 'Penn'a Live Stock Breeders' Association,' in regard to an Experiment Station exhibit at county fairs, I think such an exhibition would be an attraction to our fair worth very much more to our people than the probable cost. I think our Association would be ready to meet all the requirements as to cost and room.

"Our board will meet in February, date not fixed yet. I will bring the matter to the attention of the board at this meeting and will be able to write you more definitely.

"Very respectfully yours,

"R. P. STEVENSON, Sec'y."

COLLEGIATE EDUCATION.

No doubt it has dawned on you all before this that I have confined my suggestions to plans which largely involve our agricultural educational institutions at State College. This is for a reason, and that reason a dual one. First, our other educational institutions are largely provided for by existing laws; and second we must build our permanent structure on the foundation of education of the young. The farmer of the present must be reached in any way and at any time that we can reach him. But the farmer of the future must be sent to school for a longer or a shorter term. I am aware that Pennsylvania's Agricultural School has not had what it should have had, and has not been what it should have been. But a better day is coming. It is preparing to carry out its primary purpose, agricultural education. It is seeking men, and has found some, but money must come to support them. We must give it to them out of our State Treasury if Pennsylvania is to get into line with other states. In the past we have heard charges of fossilization, of lack of usefulness, brought against this institution. This must not be so in the future, and will not be possible except to the jaundiced mind. All such things, along with the attempt to control things by any political clique, should be swept into the

scrap heap of the past. We want no antagonisms in our college or over it.

Our only antagonists should be ignorance and prejudice—the two foes of agricultural education in all times and places. Responsible heads are being secured, and let us hold them responsible. If we give proper support to our agricultural educational institutions, there will be no excuse for any farmer not being helped by them. If we give our institutions a start, the things which I have named, or something as good, will come to pass, to the immediate and permanent betterment of things agricultural in this State. Impress the men who vote money for agricultural education with the necessity for such a start, and the people will see that they keep it a-going. I have faith in our people. If they do not wake up this year, they will sometime, because they must. But your support is needed NOW for a State Fair and for an agricultural school. The agricultural press, that noble army of men who march under the glorious banner whereon is inscribed the stirring words “Now is the time to subscribe,” is backing this cause. The farmers’ organizations are backing it. And if individual farmers will back it we shall have more progress to record in the next five years than in all the previous years of our history.

The CHAIRMAN: Since Dr. Hays does not appear to have come, we shall be pleased to hear from any one in the room on this subject, for a short time.

MR. WELD: I notice that there is with us this evening one who is interested along the line that has been talked of, and I have no doubt but that every one here will be glad to hear from him. I refer to Dr. Welch of the State College.

The CHAIRMAN: We shall be very glad to hear from Dr. Welch.

Dr. Welsh then spoke as follows:

ADDRESS OF DR. WELCH.

Gentlemen: I have been very much pleased with what I have heard here tonight, up to this point; I was especially pleased to hear the Press make itself heard in behalf of education, particularly Agricultural Education, because I have been interested in it for a good many years. For the past few months I have been especially interested, because I have been placed in a position where I am expected to look after the financial condition of the Pennsylvania State College, and, following what has just been said, I presume it would not be out of place for me to tell you some of the things that I have found.

A few months ago I didn’t know any more about the financial condition of the college, or the way the State of Pennsylvania had been taking care of the college, than any one else here, but when I went there and began to get at the bottom of things, I learned some things that surprised me, and will, I presume, surprise you.

In the first place, I heard before I went there that the Pennsylvania State College has been sailing under the banner of Agri-

culture, while spending the money for many other things. I want to say that when I came to look into the matter, I found that every dollar that has ever been appropriated toward it in the State of Pennsylvania, has gone for exactly the purpose for which it was appropriated, and that if anybody was to blame, it was the fellows who did the appropriating. Every dollar has gone to its place.

When I first went there, I heard the same complaints in regard to results under previous administrations, and this is what I found. I want to say that it was a matter of some surprise to me that any results could be secured under some of the administrations, because of the meager support that was given them.

You will be surprised to learn that in looking over the condition of the college, I found that it is \$15,000 behind in its coal bill. They had either to say to the boys "you go home; we have no more money to keep you warm," or to borrow money to keep them warm. The bill that was presented to the House a few weeks ago contained this item of \$15,000, and I think it is clear to the world that there must be heat and light for the boys, and that they must be paid for. I have been comparing the support in this State towards the Department of Agriculture, with other states. There are men here who can give these items better than I can, but when we compare the appropriations in Pennsylvania with those in Iowa and Ohio, it should make everybody in Pennsylvania who has anything to do with appropriations ashamed. That we have not been doing great things, is due more to the fact that while the rest of the world has been moving on, we have been standing still in Pennsylvania. We have not been supporting Agriculture. It is true that large sums of money have been appropriated by the State to the college for other purposes, but the reason for this is that there has been a great pressure on the part of these boys to go into these other departments. For instance, they have a school there called the School of Engineering, which includes Electrical, Mechanical and Civil Engineering. It is calculated for four hundred students, and there are six hundred in it now, and more want to come in. The appropriation there has been entirely too meager to take care of what has been done, and is doing there now.

The other day, just to see how many of these boys represented the soil of Pennsylvania, I looked for the number of boys in the Department of Agriculture, and found them about one hundred and fifty to one hundred and seventy-five as against nine hundred in the other departments. Now, under the laws of the United States Government, and the laws of Pennsylvania, the Pennsylvania State College was established for the purpose of encouraging Agriculture and the Mechanic Arts, and for extending the liberal education along other lines that are now being emphasized by the United States Government. It is right that the State of Pennsylvania should give to the young men the all-round education provided for under the law, and I am here tonight on your invitation, and I want to plead for all the departments of the Pennsylvania State College, all and every one of them: The Department of Agriculture, the Department of Mathematics, the Department of Literature, of Engineering, the School of Political Economy, all have in view one common good, and these departments are knit together, one

depending on the other for evolution. The entire school should have the support of this great State of Pennsylvania, that has an annual income of over \$20,000,000 to dispose of. So I say that I feel that the time has come for every department of that great institution to be properly supported, and I have been asked by the Board of Trustees to give them such data as will enable them to submit a bill for support to the coming Legislature that will put every department strongly on its feet. Tomorrow there will be a meeting of that Board of Trustees, and when that bill comes up it will contain exactly what is needed to put every department of this college squarely on its feet, and then I think if there are any criticisms coming, they will be due to those who do the appropriating, and not to those who are managing the institution. I believe that the people of Pennsylvania want this college to be taken care of, not simply in Agriculture, but I think they want to take a long stride in Agriculture for having stood still so long, although we don't want to spend more on that than on any other part of the college.

I don't know, Mr. Chairman, that I can say anything more, but I thank you for the opportunity of saying these few words.

The CHAIRMAN: Has any one anything further to say on this subject. It is drawing pretty near time to adjourn, but we shall be glad to hear a little more if any one has anything to say.

COL. DEMMING: Before we adjourn, the Mineralogist of the Board respectfully asks the Chairman to submit his report tomorrow evening, instead of tomorrow morning, for the reason that he is required to be in another county in court, not as a criminal, but as an expert witness.

The SECRETARY: Would you be prepared to make it this evening?

COL. DEMMING: No, sir.

The CHAIRMAN: Would you be prepared to make it late tomorrow afternoon?

COL. DEMMING: I will try to, but I am not sure.

The CHAIRMAN: We will simply have to wait until you can come.

PROF. VAN NORMAN: Mr. Chairman, I want to make the announcement that our milking machine is here, and our man who is to operate it, will be prepared to do so at nine o'clock tomorrow morning, at four o'clock tomorrow afternoon, and at ten o'clock tomorrow evening, and at the same hours the next day. The butter is in the cold storage house, and will be exhibited Thursday. We have no good place to keep it in, so have made these arrangements. The milk that is sent in will be examined by the dairy experts from Washington, and report made to you on same.

The SECRETARY: Before adjournment, I wish to announce that we still have some cards here, showing the location of the different hotels, with their rates, for the benefit of those who may require them.

The CHAIRMAN: We have reached the end of our program and the hour is growing late. A motion to adjourn will be in order.

On motion, the meeting was adjourned until 9 a. m. Wednesday morning.

Harrisburg, Pa., Wednesday Morning, 9 o'clock,

January 23, 1907.

The meeting came to order with Vice-President P. S. Fenstermaker in the chair.

The CHAIRMAN: The first number on the program is the report of Dr. William Frear, State Chemist; is he here?

It appeared that Dr. Frear was not present at the time.

The CHAIRMAN: The report of the Mineralogist has been postponed, so we will take the next one. Is Prof. Surface ready to make his report?

Prof. Surface was reported as not being in the room at that time.

The CHAIRMAN: We will proceed to the Report of the Committee on Fertilizer, if Mr. McGowan, the Chairman, is here.

Mr. McGowan then read his report, which is as follows:

REPORT OF COMMITTEE ON FERTILIZER.

BY HON. HOWARD G. MCGOWAN, *Chairman.*

The term is broad in its meaning, which would commonly include all substances that tend to increase the fertility of our land. No subject is of greater importance to our agricultural people than is that of Fertilizer. The fertility of a man's farm is the mainspring to his business. It is his bank account. It is his reserve fund, from which he can draw upon, to supply that which enables the farmer to conduct his business remuneratively. Therefore, every farmer should look more carefully after the fertility of his land.

Many homes would be happier, farms richer, and the spirit of contentment would pervade, where very frequently we find from the want of proper fertilization, the farm becomes poor, unyielding in crops, much to the discouragement of the farmer, and discontent of his family. Even the boys and girls will not so soon become restless when the farm is rich and abundant in crop production.

The proper care of the farm manure, which is our main fertilizer, is first to be considered by every farmer. This caution has been so frequently referred to, and impressed upon the minds of our farmers by the agricultural papers and Farmers' Institute lecturers, that it needs only a word of continued vigilance from our committee. We know of very many instances, however, where farm manure as a fertilizer is very much disregarded. In some parts of our country it is even dumped into ravines. In Missouri, not

in Pennsylvania, it is dumped by the roadside, while in Oregon it is given away for the asking. In these instances they need the teaching of Farmers' Institutes. We feel that the term "fertilizer" largely applies to commercial fertilizers in our connection, and to this end we will dwell for a few moments and suggest a few things.

We would recommend the Commercial Fertilizer be not depended upon entirely for the fertility of our land, but, be used as a valuable aid to assist in crop production, after the most judicious care has been taken of all other sources of fertility.

Commercial Fertilizers are costly, make high bills for the farmer, and in Pennsylvania thousands of dollars are uselessly spent by our farmers. The use of Commercial Fertilizer in Pennsylvania from all sources where we have had any opportunity of obtaining information, has, during the last year, far excelled that of any former year in our history. Farmers are becoming more and more expert (some are not, however), in buying fertilizers intelligently by adhering more closely to the analysis which is printed on the sack, as is now provided by law. Three elements control the value of any fertilizer and they are too well known to speak of at any length, viz: Nitrogen or Ammonia, Phosphoric Acid, and Potash.

By using a little arithmetic any one can in a short time calculate the value of any brand of Commercial Fertilizer on the market today. Vast sums of money are uselessly spent annually by the farmers of our State by not taking the proper pains in making calculations before purchasing. They simply buy a fertilizer by its name and not by what it is worth on the market. This haphazard way of buying fertilizer, (not by all) is like buying a suit of clothes for so much cash, and not taking into account its real value. A ten dollar suit is worth about that amount, and we know it.

When we have asked some farmers in our experience what kind of a fertilizer they use on their farms, in many instances they would say about \$18.00 goods or \$20.00 goods, as the case may be. This really does not indicate anything at all. If, on the other hand, you would ask him what kind of a fertilizer he uses and he tells you 1, 8, 4, or 2, 8, 10, or 10, 6, as the case may be, you can just put it down that he knows just what he is doing, so far as the law is at present.

We would recommend for consideration by this Board of Agriculture, if it would not be advisable to press upon the present Legislature, to pass a law in reference to placing upon the outside of each sack of fertilizer, not only the analysis as it now is but state from what source the different ingredients are derived. While, as I said before, we may buy intelligently as far as we can, but would not the farmer be fairer dealt with if he would know from what source he was obtaining the different elements in the composition of the fertilizer?

The Department of Agriculture has been aiding the farmer, very greatly, by having samples of fertilizers collected all over the State and subsequently having them analyzed at the State College by the State Chemist. This work is done (and is generally known) for the purpose of ascertaining whether the contents of the sack, is just what is printed on the outside of it. Sometimes farmers

ask the question: "What is the consequence if the analysis on the bag does not conform, or come up, to the statement on the bag? Is the manufacturer informed of it, and forced to make good to the users of such fertilizers?" In reply, please let me say that from direct knowledge, our present Secretary, Hon. N. B. Critchfield, has been doing all within his power to bring parties to an account whose goods upon the market were found deficient in value according to printed or guaranteed analysis. In one instance, to my knowledge, the Secretary brought suit against a certain manufacturer and personally saw to it that said manufacturer made proper restitution or refunded the amount of loss that parties suffered by the analysis being deficient. True, a fine is collected also, as a punishment. But, as the present act makes it a fine of only \$25.00, we, the Committee on Fertilizer, think, and would suggest, that this fine should at least be \$200.00 instead of \$25.00.

We also beg to suggest, as the Committee on Fertilizer, that it would be wise and expedient in order that the law might be more closely guarded, to establish a "Bureau of Fertilizer and Feed Control." Under this head prompt prosecutions could be brought, and in all cases where any shortage occurs, it would be the duty of this Bureau to prosecute, and thus leave no manufacturer go unpunished, whose goods did not meet the requirements of the act. This Bureau would be under the supervision of the Secretary of Agriculture.

The CHAIRMAN: Gentlemen, what is your pleasure in regard to this paper?

Moved and duly seconded and agreed to that it be received and placed on file.

The CHAIRMAN: We might devote a few minutes to the discussion of this paper if any one has anything to say.

A Member: With your permission, Mr. Chairman, I would like to ask whether there is not on the statute books of our State, a law that if the fertilizer does not come up to the standard stamped on it, the manufacturer is at fault, and is liable to prosecution?

The SECRETARY: No; there is no statute, but my impression is that there is a common law that if the consumer or purchaser does not get the value of the goods, the manufacturer is expected to make good the amount, but there is nothing in our fertilizer law as it now stands. The law, as it now stands, simply states that there shall be placed on the sack the name of the manufacturer, the place where it is made, the percentage of Phosphoric acid, soluble and insoluble, and Potash. The law provides that any person who places upon the market goods that are not so marked or goods that contain a larger percentage of these fertilizing ingredients, is guilty of misdemeanor and can be fined not less than \$25.00 nor more than \$100.00.

A Member: I don't think that there is a subject that can come up at this meeting in which the farmers are more deeply interested than in this subject of fertilizers. There is nothing that we purchase on the farm for which we spend more money than we do on

fertilizers, and when I buy fertilizer I want to know from what sources the ingredients are secured. I think there should be a law compelling them to publish that. I have a little farm of twenty-seven acres in Chester County, and that farm is my chemist, and it is better than any Professor. I have a friend within a few miles, who has a little farm, and he has the potash right on the road. You can see it there, as you walk or drive by. He does not need any potash, but on my farm I need it. I want all the potash I can get, but I find that what will produce a crop on one acre will not do so on another. And I have no doubt that many farmers spend thousands of dollars in applying fertilizer without knowing just what is the best for that soil. Now, I went through this, and at considerable expense, so I know there is no subject in which the farmers are more deeply interested than in fertilizers.

The SECRETARY: There is a bill before the House now, requiring manufacturers of fertilizers to show not only the amount of nitrogen and phosphoric acid, but where it was secured. Then if the farmer wants something that will act quickly he can get his nitrogen and soda, and if he wants something that will act a little more slowly he can get his dry blood, and if something that acts more slowly still, he can get his raw bone. The bill says that when these things are stamped on the bag, the manufacturer shall stop right there, and not go on and give any further information, because it would be misleading.

MR. SCHWARZ: I am very glad to see that the farmers are taking interest in this. Twelve years ago, when I was in the Legislature, a bill was passed, largely through my efforts on this subject, and I am glad to see that the farmers are progressing along this line.

MR. BECK: I am glad to say that when the bill Mr. Critchfield refers to was up before the Legislative Committee yesterday, there was no opposition to it, and it is likely to pass.

The SECRETARY: I am glad to know that it is moving along so nicely.

The CHAIRMAN: I see Dr. Frear is here now, and we will take up his report—the report of the Chemist.

The report reads as follows:

EXPERIMENTS WITH LIME AND CRUSHED LIMESTONE ON A PENNSYLVANIA CLAY LOAM SOIL.

BY DR. WM. FREAR, *Chemist, State College, Pa.*

Owing to the live interest exhibited today in the relative merits of lime and crushed limestone (carbonate of lime) as means of increasing the productiveness of soils—an interest shown by numerous inquiries received by the writer and by the frequency with which the subject is discussed in the agricultural press—it has been thought that a summary of the results obtained in experi-

ments upon the subject at the Pennsylvania Experiment Station might well be presented at this time.

Permit me at the outstart to present a brief statement of the present practice in Pennsylvania and to note some of the claims made by advocates of the two agents to be compared.

Pennsylvania is richly supplied with limestone, in strata readily accessible in the eastern counties, less easily reached in the western and northwestern counties and entirely lacking in the exposed strata of the northern and the extreme western parts of the Commonwealth. The use of lime, as shown by a careful inquiry made several years ago, is extensively practiced by the majority of Pennsylvania farmers, especially by those whose lands are clays or heavy loams. Even in communities where, for a time, the introduction of commercial fertilizers led to the abandonment of liming, the occasional use of lime has again come into vogue as a valuable means of controlling the conditions of crop production. The use of carbonate of lime, except as it has been applied in the form of wood ashes to the orchards and gardens on the stony hillsides of our northern counties, has on the other hand, been very limited.

The general consensus of opinion, based upon the extensive local experience in the practice of liming, is, that lime is an excellent agent for the maintenance of good tilth on heavy lands; that, when properly used, it greatly increases the crops produced, and leads to no observable deterioration of lands of strong character; and that it is a specific for the treatment of our soils. There are many communities, however, where the old saying, 'Lime enriches the father, but impoverishes the son,' is frequently heard, especially with reference to farms on which care has not been taken to maintain the humus and nitrogen supplies by careful husbanding of the straw and manure, and by the skillful use of green manuring. The need for the exercise of caution in liming light lands, lest they become over alkaline or be injured in texture, is quite generally recognized.

The advocates of the use of crushed limestone and other carbonates of lime, in place of lime (caustic or slacked lime), claim that the carbonate performs practically all of the functions of lime in the soil and should be preferred because it is the compound in which nature furnishes this valuable alkaline earth. Lime is said, by them, to work too rapidly and therefore wastefully, especially in the destruction of humus and the conversion of the insoluble stores of nitrogen into soluble forms that, because present in excess, produce stem and leaf out of proportion to grain, and that leach away in drainage waters before the crops can utilize them. Lime is further said on the basis of many laboratory observations, to retard the development of certain valuable soil bacteria, especially those that gradually convert the slightly available humus nitrogen into highly available nitrates; whereas, carbonate of lime is declared to be always helpful, rather than prejudicial to the best development of these little friends of the tiller of the soil.

The results to be considered shed some light upon a number of points in the controversy. The field experiments included from a part of the general fertilizer experiments begun at State College in 1880 and still in progress—the longest continued series of fertilizer experiments in America.

The soil is a rather heavy clay loam overlying and formed from the Silurio-Cambrian limestone strata of Nittany Valley, a soil probably to be classed with the so-called "Hagerstown loam," which forms a part of the limestone lands of northern Lancaster county and of Cumberland Valley. The writer has not had opportunity to analyze completely the rocks underlying the soil in question, but analyses of samples taken from corresponding strata nearby show very small amounts of clay and iron, and even very little carbonate of magnesia.

The soil used for the experiment plots was not analyzed at the beginning of the experiments. It is probably represented fairly, however, by samples taken from a neighboring field showing similar characters. The soil sampled had never been limed nor intensively treated with commercial fertilizers. Despite its limestone origin, this soil contains only 0.26 per cent. of lime and 0.35 per cent. of magnesia, with merely 0.39 per cent. of carbonic acid—an amount sufficient to form carbonate with barely one-fifth of the lime, which, with the magnesia, must therefore be present in other states of combination. Crop experience on these lands shows little need for potash fertilizers, for most crops and analyses show as much as .34 per cent. of potash, .039 per cent. quite available. Experience shows, however, a pronounced advantage from the use of phosphates, whether acidulated or non-acidulated, despite the presence of .124 per cent. of phosphoric acid (P_2O_5), an amount fully equal to the average in the Eastern States. Of this fully one-tenth appears to be available, judging by the action of mild solvents. The soil was found to contain a fair amount, 2.2 per cent., of active humus, and a moderate quantity of nitrogen, .116 per cent. Of the latter, constituent, about one-fortieth was present in the form of ammonium salts and over one-tenth in the form of nitrates—the samples having been taken in late summer when the land was in corn, conditions favoring a large accumulation of nitrates.

Laboratory experiments were made by mixing lime at the rate of 150 bushels per acre with the soil, keeping it moist for three months and then allowing it to dry gradually. At the close of a year the availability of the potash and phosphoric acid had been distinctly increased, the active humus had been reduced nearly one-third, and the proportion of nitrogen had somewhat diminished. The quantity of ammonia was much reduced, and, despite the alkalinity of the soil, the absolute quantity and the proportion of nitrate nitrogen had as clearly increased. Of the large quantity of lime applied, less than one-half had been converted to carbonate, a fact contradicting the opinion of those who hold that caustic lime is sure to be promptly carbonated in the soil. It should be remembered that the soils bore no crops during the time of the laboratory experiments.

In the general fertilizer experiments conducted under the ordinary four-course rotation of corn, oats, wheat and hay (mixed clover and timothy), four plots have received dressings of 4,000 pounds of stone lime slaked after weighing and applied upon the land after plowing for corn. Four others have received similar applications to

the wheat and the corn of 4,000 pounds of crushed limestone, harrowed into the plowed ground. In 1859 the whole farm was heavily limed and has until recently shown little need for the use of this material. Great gains from liming should from this fact, not have been expected. It is at once apparent that the frequent liming at the rate of 50 bushels of stone lime per acre during the long period of these experiments, is an extreme test of the effects of the method.

The actual quantities of lime applied in the two forms during a rotation are not far different. The cost of the lime was 5 cents per bushel, equivalent to \$2.50 per acre, while the cost of the fine crushed limestone was \$6.50 per ton on the average, equivalent to \$26 per acre during a rotation. This cost may be greatly reduced by purchasing the crushed stone in large quantities, but will remain much greater than the cost of the fine powder obtained by slaking burnt lime.

The quantities of the several crops obtained on the two lots of four plots each, receiving the several treatments, during twenty years, or five complete rotations, the yield of the adjacent unfertilized plots being taken as 100, were:

Combined Yields for Five Rotations.

	Lime.	Crushed lime-stone.
Corn:		
Ears,	84.3	92.0
Entire crop,	86.7	94.0
Oats:		
Grain,	88.1	102.8
Entire crop,	108.3	119.0
Wheat:		
Grain,	106.8	110.4
Entire crop,	107.0	112.0
Hay,	91.8	103.6

That is to say, in each case the yields with the carbonate of lime showed superiority under the conditions of this experiment over those following an equivalent application of caustic lime. After each of these treatments, however, the corn yield was depressed. The yield of threshed oats was depressed by the lime and little affected by the carbonate; but both increased the total crop, the carbonate most. Both treatments were followed by an increased yield of wheat—grain and straw—a slight advantage again appearing on the side of the carbonate. Lime greatly depressed the following hay crop, however, while carbonate slightly increased it.

The total application of lime in five rotations was very large, amounting to 10 tons per acre, equivalent to 0.5 per cent. of this soil taken to the depth of 8 inches. So that, if the lime were not largely removed by descent to subsoil or by solution in drain waters, nearly 1 per cent. of carbonate of lime could be formed from it in the

surface soil. This percentage is not usually considered high enough to threaten injury to crops on heavy loams.

It is desirable, nevertheless, to compare the effects of the lime and carbonate treatments during the first and last rotations, to observe whether any action is manifest as a result of the accumulation of calcium carbonate in the soil. The comparative yields for these rotations, expressed in ratio with the yields of the adjacent unfertilized plots for the same years, are given below:

	Lime.		Carbonate.	
	First rotation.	Fifth rotation.	First rotation.	Fifth rotation.
Corn:				
Ears,	91.0	82.8	110.6	112.4
Entire crop,	91.4	88.1	115.0	110.5
Oats:				
Grain,	94.3	83.6	104.0	110.5
Entire crop,	99.5	109.2	115.6	118.8
Wheat:				
Grain,	94.4	108.9	86.2	119.8
Entire crop,	92.7	109.9	88.5	122.2
Hay,	87.8	95.9	98.6	118.0

Judging from these data the heavy applications of lime injured corn and oat grain yields more after the first rotation, but the crops of intermediate rotations show that it was not a distinctly increasing degree. On the other hand, the use of lime depressed the wheat yield at first, but increased it in later rotations and injured hay less. The carbonate shows little change in effect upon corn and oats during later rotations, but depressed the wheat and hay yields at first and increased them in later years.

Certain crop peculiarities are apparent in consequence of these treatments: The leaves of corn on the carbonate plots have a healthy green color; those of plants on the lime plots are yellow when young, and striped with deep red colors when mature. On both sets of plots clover far exceeds timothy; the ratios between ear and stalk show a slight increase of stalk in corn after either treatment, practically no change in case of wheat, but a very marked increase of oat straw in proportion to the grain, an increase somewhat the more pronounced with the lime treatment, but visible with the carbonate treatment also.

The crop results justify the statement that the use of lime in the manner adopted for these experiments and under the conditions previously mentioned cause a net decrease rather than a gain in production; whereas, the carbonate of lime exhibited a slight increase, but entirely insufficient to pay for the cost of the carbonate applied.

Partial analyses of the soils of these plots made 18 years after the experiments were begun showed the presence in the soil treated with carbonate of lime, of practically the same amount of organic carbon

as in the unfertilized soil, and somewhat less active humus; whereas, the limed plots showed one-eighth less organic carbon and one-tenth less active humus than the unfertilized plots. That is to say, the lime used in excess tended clearly to depress the humus supply in the soil. Nevertheless, the rate of decrease was very slow, and where manure was used in moderate quantities with lime the humus content did not diminish.

In the case of the nitrogen, likewise, the carbonate plot shows a distinct gain over the unfertilized plots, whereas, the limed plot exhibits a deficiency amounting to one-eighteenth of the entire quantity in the unfertilized soil—a decrease readily accounted for when the liberation of ammonia and more rapid destruction of humus in limed soils are considered. When, however, manure was used with lime, the soil showed a very pronounced gain in nitrogen far exceeding the proportion of gain in humus in the same plots. That is to say, in the manure, as in the soil, the influence of lime leads to a more rapid destruction of carbonaceous than of nitrogenous matter.

To conclude, the use of crushed limestone in large quantities applied biennially was slightly advantageous, both as regards crop yield and influence upon the humus and nitrogen supplies of the soil, while the use of corresponding quantities of lime, applied every four years, led to diminished crop yields, other than those of wheat, and to a slight but appreciable diminution of humus and nitrogen in the soils. It is probable that the relative gain in the soil nitrogen and the crop increase were collectively sufficient in this case to pay the extra cost of the carbonate.

Considering, however, the fact that the use of lime in these experiments was highly excessive, that the soil had, when the experiments began, no particular need for the addition of lime, and that the losses of soil and crop from its use were not very great, it is improbable that the results above stated would warrant Pennsylvania farmers who are tilling and cropping heavy clays and loams in substituting the more expensive and less perfectly distributable crushed limestone for the much more cheaply and perfectly subdivided, slaked lime used in equivalent, moderate quantities.

A Member: Then you do not advocate the free use of lime?

DR. FREAR: Not always; but I think the question resolves itself into this: whether the soil contains sufficient lime for the amount of humus that is in it, and the texture. Now, in light soils there is not so much danger in the use of lime, but we have very few soils and it is a common experience that we cannot use much lime to advantage. I might refer to the soils of Rhode Island and of France as examples of the tendency to decrease the product by the use of the lime.

MR. STOUT: Do we apply enough fertilizer in the shape of lime for the use of our crops, whether we use the raw rock or the acidulated fertilizer?

DR. FREAR: Yes. I think I might answer that the average farmer of Pennsylvania is applying to the land in one form or another

practically all the calcium which the crops remove. We have to consider the tilth of the soil, and the amount of lime carbonates in the soil also in this connection and not put on the lime for the sole purpose of applying it.

MR. WING: I would like to ask a question. I would like to know whether the crushed limestone will really destroy plants from the soil?

DR. FREAR: I find that it will practically destroy the humus.

MR. WING: I had an idea that it would not.

DR. FREAR: It does so more slowly, and therefore on soils of slow growth, or on light soils, the carbonate of lime should be used. When the limestone is air-soaked it loses a large part of its causticity and in a slight application of six, eight or ten bushels the danger is very much less.

A Member: We have in our country what is known as a carbonate of lime and also what is known as magnesia of lime. Does the magnesia affect the soil in the same way?

DR. FREAR: I have given some attention to this, and I believe that if the magnesia of lime is present in very great quantities it might do so, but from what I have gathered from the use of magnesia of limestone throughout the State the danger is very slight, but the magnesia is found only in limited portions of the State.

MR. WING: In my part of Ohio you will find a great deal of this magnesia of limestone. The glacial action ground up the limestone and if you dig down under the ground six inches you will find a great many pebbles of magnesia limestone, some of them as large as hen's eggs.

At this point the discussion was broken off by the entrance of the Hon. Edwin S. Stuart, Governor of Pennsylvania, who, upon being presented by the Secretary, spoke as follows:

ADDRESS OF GOVERNOR STUART.

Mr. Chairman and Members of the State Board of Agriculture: I have been a very busy man since I came to Harrisburg, and consequently have not had time to make any preparation for my talk to the Board today; but I desire to assure you that there is no body of citizens in this State for whom I would be willing to do more to advance their interests than for the farmers of the State of Pennsylvania. (Applause.) I understand from some statements over which I glanced today that the farm products of Pennsylvania are greater than almost any other State in the Union. That alone would make any citizen proud of the State, and I assure you that you are not more so than I am. I cannot, perhaps, talk to you with as great knowledge of farming as some of my predecessors, but any man who has been Governor of Pennsylvania understands the value of the work done by farmers, not only as farmers, but as citizens. In all

my knowledge of the people of Pennsylvania there has been no more law-abiding people and no people quicker to add to the worth of the State and the Union than the farmers of this State and other states. (Applause.)

But there is one thing that I can't help talking about, and that is where I know that the farmers, outside of their farming interest, have been of great help to the cities of the Commonwealth. In all of the cities, particularly in the city where I come from, and where I have spent all my life, some of the best citizens have come from the farmers of Pennsylvania. Some of its most prominent men in profession and business have been farmers' sons who have come to the city. Many of its representative men in business and philanthropy have been the boys who were trained at the country fireside, and have there been taught the duties of citizenship, and they have done and are doing everything to make the city better as well as adding to the growth of the State of Pennsylvania.

I don't want to talk long today, but I want to thank you for sending that committee to me and to assure you how highly I appreciate you. And while the farmer, like many other citizens of the State, may have a great deal to ask for that it is impossible for me to give him, I will always be ready to hear and talk, and do everything in my power to advance the cause of one of the greatest interests of the State, and one which may not have been as highly appreciated as it should have been by those making appropriations, and anything I can reasonably do, I will do to advance the cause of the great farming interests of our Commonwealth. (Applause.)

The CHAIRMAN: The discussion of the lime question will be continued.

MR. WING: I would like to continue my remarks about the magnesia limestone in my own country. Now, there are grown in our country, round about me, probably 10,000 tons of alfalfa each year, and it grows so easy that it seemed to us it would grow anywhere. It seemed to us that it grew to advantage in the soil containing the limestone pebbles. But I have seen farmers in Pennsylvania who put loads of manure on their land, fail to grow alfalfa, and, knowing the character of our land at home, where we grow alfalfa so easily, it seemed to me that the land must be deficient in limestone. I began to think it was because the limestone pebbles in our soil would not neutralize the acid of the alfalfa and red clover that we grew them so easily, while in other countries where they have not these limestone pebbles, and cannot grow it, the acids must become neutralized by the lack of limestone. That is the reason I was sorry to hear the Doctor say the lime would do harm. One hundred tons of crushed limestone would make eight tons to the acre in a twelve-acre field, and I have been advising some of the farmers who failed to grow alfalfa to try it, and I am sorry if I have misled them.

DR. FREAR: I don't think that Mr. Wing has been giving these people advice that will lead to their injury or loss. The question does not apply to acid that is needed by the land in the form of crushed limestone, but do not apply it in the form of slaked lime. As I have shown this morning, the carbonates of lime are not nearly so harmful as the use of the lime itself.

MR. WING: How much does crushed limestone cost you here?

DR. FREAR: About \$6.50 on the average.

MR. WING: We have the advantage of you in Ohio. We can get it on cars at \$1. I have thought, though, that it is like throwing away money to put six, eight or ten tons of lime on the land to prepare it to grow alfalfa. Several years ago when I was in England and France I saw the deep pits from which the lime had been taken, and saw the trees banked up with it, and I asked Mr. Yates what those pits were. He told me that was where they had taken out the lime to grow clover. Nothing in the world is better for this purpose than lime.

DR. FREAR: The carbonates, but not the slaked lime.

MR. WING: I never saw such clover as they grew there, and as the clover is a good preparation for the alfalfa, I thought that if crushed limestone would do this, it would be a safe investment at a dollar.

The CHAIRMAN: Anything further?

MR. HARGETT: I am a stranger here, and did not hear all that was said. May I ask whether the question refers to ground limestone or some other particular form of it?

DR. FREAR: Just the rock.

MR. HARGETT: Our experience in Maryland has been that burning the rock is the best way to apply it.

DR. FREAR: In 1859 the whole of the College Farm was thoroughly limed, and now, after a period of about forty years, we find that here and there further applications will be necessary. Had this lime been put on in the form of carbonate of lime, rather than in the form of a caustic, the effect would have been complete in a very short space of time.

MR. WING: May I ask for further information regarding the plots you have at your college? I was interested in your reference to them. You gave the figures for twenty years, did you not?

DR. FREAR: In my paper today I gave the figures for twenty years; it is now in its twenty-seventh year.

MR. WING: I did not have the figures and therefore did not know. In Kentucky and Tennessee the soil rests upon a very hard limestone, and therefore the people there have presumed that they did not need this lime; but, I suppose, the world has been leaching for six thousand years and they are now feeling the need of it, and I have discovered that where they have begun to use the limestone, the growth of the crops has been doubled in a few years.

MR. STOUT: I would like to ask the Doctor whether this limestone that is being sold throughout the country as high as \$20 per ton has any advantage over the ordinary crushed rock?

DR. FREAR: I can't answer that from my own experience, since we have not experimented with it, but Prof. Patterson, of Maryland State College, gave it a trial and found it an excellent caustic lime, but I do not believe that I would pay \$20 a ton for it, and I would advise my farmer friends of Pennsylvania that the difference between eight or nine cents per bushel and that amount would be too great, even if it had several advantages over the ordinary caustic lime.

The CHAIRMAN: Is there anything further? If not, what shall be done with this paper?

On motion, duly seconded, it was agreed to receive it and place it on file.

MR. HERR: I move that we take a recess of fifteen minutes to greet the governor.

Duly seconded and agreed to.

After the recess, during which time all members and visitors fell in line and shook hands with the Governor, business was resumed as follows:

The CHAIRMAN: We will now be addressed by Prof. Hunt, of State College.

Whereupon Prof. Hunt spoke as follows:

THE PROMOTION OF AGRICULTURE IN PENNSYLVANIA.

A COMPARISON.

BY PROF. THOMAS F. HUNT, *State College, Pa.*

Coming from a sister State to the State of Pennsylvania to become the Dean of your School of Agriculture and Director of your Experiment Station, I might, perhaps, be expected to outline in a somewhat comprehensive manner the policies which will actuate me in the performance of the duties which will be placed upon me by the board of trustees of the Pennsylvania State College. This, however, I shall not this morning attempt to do for several reasons.

In the first place, the general aims and purposes of the School of Agriculture and Experiment Station are now fairly well understood and do not need stating to an audience of this character.

In the second place, I do not expect to change in any radical way the policies which have been pursued under the most excellent administration of Dr. H. P. Armsby and his associates. I do hope to add to and extend the agencies already existing. I believe in evolution, not revolution. The way to repair a leak in the roof is not to tear down the house and build a new one. The better way is to add some new shingles.

In the third place, I wish to take the brief time that is at my disposal in talking to you of ways and means rather than of ideals and operations, of finances instead of fancy. Perhaps it is just as well that I do not have time to draw for you the picture which I see painted against those beautiful hills in Centre county, where, amid

pure air and wholesome surroundings, stands an institution which contains potentialities of which Judge McAllister and Judge Beaver in turn have dreamed for fifty years, but the fruition of which has been delayed, at least in part, because the great and splendid State of Pennsylvania, whose very name is taken from the disciple of the art of peace and whose resources are almost boundless, has never been shown the way, or, having been shown it, has not been able to follow the path.

If I should paint for you the picture you might think me a dreamer of the dreamers, and having painted it, in after years you might make comparisons between the dream and the actualities. Furthermore, I want you to think of me as a very practical, close to the earth sort of an individual that has to deal with accounts and unpaid bills, appropriations and other mundane and sordid affairs.

If I were to give my address a title this morning it would be "The Promotion of Agriculture in Pennsylvania. A Comparison."

I invite your attention first to a table showing the agriculture of the four most populous and wealthy states in the Union in order of population and wealth: New York, Pennsylvania, Illinois and Ohio. These states have been chosen because they are the states that are in the same class with Pennsylvania. What Vermont, or Florida, or Idaho are doing to promote agriculture can be of little interest to us at this time, since they are not in our class.

The agriculture of these four states is somewhat similar, as shown by the following table:

	Pennsylvania.	New York.	Ohio.	Illinois.
Total value of farm property in million dollars,	1,051	1,070	1,199	2,004
Total value of farm products in million dollars,.....	207	245	257	346
Number of million acres of farm land,	19	23	26	33
Number of million acres of improved farm land,.....	13	16	19	28
Value of farm products per acre,	\$10 90	\$10 70	\$9 90	\$10 50
Value of farm products per acres of improved land,...	16 00	15 30	13 50	12 40

The figures in this table are not given to prove the relative profit in farming in the several states. They are given to show that Pennsylvania has an agriculture that is worth while. They prove beyond peradventure that Pennsylvania is a great agricultural State. The reason that some other states are considered greater agricultural states than Pennsylvania is not because their agriculture is so much greater, but because their other industries are so much less. Take the State of Nebraska. You think of it as a great agricultural state, and it is. A state that, practically speaking, has neither lumber, nor building stone, nor iron ore, nor coal, nor oil, nor gas, and not even falling water enough to create electric power, must of necessity be an agricultural state if it is going to be anything. As a matter of fact, Nebraska is three-fourths larger than Pennsylvania, and the value of its farm products were, in 1899, about three-fourths that of Pennsylvania.

Aside from the four states mentioned in this table, if we assume the value of the farm products to be a measure of the agriculture of

the state, then there are five other states that may fairly be considered to be in the same class with Pennsylvania, viz: Iowa (365), Texas (239), Missouri (219), Kansas (210), and Indiana (204).

While these figures do not show the profit in farming, it may be well to point out in passing that the two great eastern agricultural states, Pennsylvania and New York, stand out from their sister states further west in producing a larger quantity of what may be called expert farm products—products requiring expert knowledge and skill, such as fruits, flowers, vegetables, dairy products and poultry. Further, there are greater opportunities for development along these and similar lines. I believe the passage of the National pure food meat inspection laws are not only going to be of vast benefit to the consumers, but also to the eastern farmers who desire to produce an honest, high grade article. But I am to discuss certain phases of that subject before the State Breeders' Association tomorrow and will not pursue it further now.

I wish to call your attention to what is now being done elsewhere to promote agriculture. For this purpose I have chosen the State of New York. New York and Pennsylvania are alike in three important particulars:

1. They have about equal ability to promote agriculture.
2. Their agriculture is much alike in quantity and kinds, in some respects as much alike as two peas.
3. The market problems are much the same.

All of which bring about similar need of activities both on the part of your State Department of Agriculture and your Experiment Station.

Appropriations for promotion of Agriculture by the New York State Legislature of 1905-6.

Funds available from October 1, 1905, to September 30, 1907.

General expenses, department of agriculture,	\$337,570
Bureau of farmers' institutes,	40,000
Horticultural inspection,	50,000
Agricultural statistics,	7,800
Diseases of domestic animals and litigation and payment for cattle,	69,603
Pure food, feeding stuffs and fertilizers,	21,500
Sugar beet industry, including inspection,	65,131
State fair commission and buildings,	190,350
Premium at county fairs,	476,327
New York State Experiment Station for maintenance and new buildings,	170,500
New York State Colleges for maintenance and new buildings,	372,360
New York State Veterinary College for maintenance,	50,000
School of agriculture in St. Lawrence County,	80,000
	\$1,931,141

Of the above, \$672,860 is for education and research.

Appropriations for promotion of Agriculture by the Pennsylvania State Legislature for 1905-6.

Funds available from October 1, 1905, to September 30, 1907.

State Board of Agriculture,	\$3,500
Department of Agriculture,	90,000
Dairy and Food Division,	174,800
Nursery inspection,	60,000
Feeding stuffs,	5,000
Special investigations,	5,000
Diseases of domestic animals,	40,000
Live stock sanitary board,	90,000
University of Pennsylvania, buildings for veterinary medicine,	100,000
School of Agriculture, Pennsylvania State College, buildings,	77,500
School of Agriculture, Pennsylvania State College, maintenance,	30,000
Experiment Station, Pennsylvania State College, maintenance,	10,000
	<hr/>
	\$685,800
Returned to State Treasury by Dairy and Food Division,	162,580
	<hr/>
	\$523,220

The agriculture of a state may be promoted in three ways: First, by research or scientific experiment to determine new truths relating to agriculture; second, by education in and for agriculture; and third, by the enforcement of the laws and other executive and police powers. These three functions are by no means the exclusive functions of the state and are not exercised exclusively by the state, but the state has recognized that they are state functions by the establishment of the Department of Agriculture for executive and police functions at Harrisburg and by the establishment of the School of Agriculture and the Experiment Station at State College. I have shown you that the State Department of Agriculture has plenty of precedent in asking the Legislature for its just needs; that it is conducting its executive enterprises and police powers at very much less cost than New York State. It would not be proper for me to say anything further about the development of the Department of Agriculture, but I may without impropriety outline to you briefly what the needs of the State School of Agriculture and the Experiment Station at State College are. I am able to do this largely as an outsider. Frequently one can see a situation from the outside perhaps better than if he were on the inside.

I next invite your attention to the annual appropriation for maintenance of agricultural education and research, that is, exclusive of buildings or betterments, in the four states of Pennsylvania, New York, Illinois and Ohio for the present fiscal year:

Agricultural Education and Research—Maintenance for Current Year.

	Total income.	By legislation.
New York,	\$223,800	\$188,700
Illinois,	181,000	131,000
Ohio,	150,725	110,485
Pennsylvania,	55,000	20,000

The activities of an institution may be shown by other ways than the money expended. The employes devoting themselves to agricultural education and research are as follows:

	Teachers and scientific workers.	Other employes.	Total.
New York,	94	63	157
Illinois,	48	63	111
Ohio,	35	48	83
Pennsylvania,	20	23	43

If a person has never had to prepare a budget for the maintenance of a school of agriculture and experiment station, he can hardly realize how much money it takes. Having been called upon to prepare such a budget I give you the result of my investigations.

The budget submitted by the Dean and Director to the Executive Committee of the Pennsylvania State College for the next two years is as follows:

Budget of the School of Agriculture and Experiment Station. The Pennsylvania State College.

	1907-8.	1908-9.
1. Dean and director's office,	\$26,020	\$26,020
2. Agronomy,	8,109	8,600
3. Agricultural chemistry,	4,200	4,500
4. Agricultural extension and short courses,	3,500	3,500
5. Animal husbandry,	8,400	11,900
6. Botany,	5,800	5,800
7. Correspondence courses and poultry husbandry,	13,080	13,280
8. Dairy husbandry,	10,460	10,400
9. Experimental agricultural chemistry,	13,540	14,540
10. Forestry,	4,500	6,800
11. Landscape gardening and floriculture,	5,400	5,400
12. Horticulture,	5,300	6,500
13. Zoology and entomology,	2,300	2,500
14. Rural engineering,		4,700
15. Home economics,		9,000
Experiment station,	15,000	20,000
Institute of animal nutrition,	13,000	13,000
Total,	\$138,540	\$166,440

The question has been raised, and therefore may occur to you, as to the character of the expenditures in the Dean's and Director's office. The following table gives an analysis of the budget for this office.

Salaries,	\$8,220
Expenses of Station farm,	3,500
Publications,	3,500
Stationery, postage, etc.,	1,000
Library,	1,000
Traveling,	500
Repairs,	1,500
Janitor services,	1,000
Contingent,	1,000
Emergency fund,	4,800
	<hr/>
	\$26,020

Of this amount, \$15,160 will come from Federal funds; \$10,860 is asked of the State Legislature.

The Experiment Station will receive from the Federal Government \$24,000 for the fiscal year 1907-8, and \$26,000 for the fiscal year 1908-9, and its estimated annual income from fertilizers is \$13,000. Deducting these items from the budget stated above, there will be required for maintenance about \$100,000 for the fiscal year 1907-8, and \$125,000 for the fiscal year 1908-9.

The Executive Committee has estimated that \$100,000 will be required to complete and equip the new agricultural building and complete the equipment of the dairy building. A new building is required for forestry, horticulture, zoology, and entomology at a cost of \$100,000. Some additional buildings are required for poultry husbandry, and two residences are required, one for the Dean and Director and one for the poultryman. The Executive Committee are therefore asking \$125,000 for new buildings. If all these requirements of the School of Agriculture and the Experiment Station are to be provided for by the State Legislature, the appropriation must be as follows:

Maintenance for 1907-8,	\$100,000
Maintenance for 1908-9,	125,000
Completion and equipment for Agricultural building, ..	100,000
Buildings for Forestry, Horticulture, Zoology, Entomology, Poultry, and two residences,	125,000
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Total,	\$450,000

The question now arises as to what would happen to the Pennsylvania State College if the State Legislature should increase the appropriation for that institution.

Income of the College of Agriculture and Experiment Station in the University of Illinois during ten years:

Year.	Funds.	Teachers and investigators.	Agricultural students.
1897,	\$22,000	8	19
1898,	22,000	9	25
1899,	43,000	16	90
1900,	43,000	17	159
1901,	103,000	28	232
1902,	102,600	27	284
1903,	190,000	37	339
1904,	190,000	37	406
1905,	201,000	44	430
1906,	201,000	48	450

It is evident from this table that the amount of money and the number of teachers have something to do with the number of students.

The Pennsylvania State College is not merely an Agricultural School and an Agricultural Experiment Station. It is, in fact, a State University, since it is a collection of schools, the most important of which in point of development and number of students is the Engineering School. Probably three-fourths of all the students attending State College are in the Engineering School, which takes high rank among the Engineering Schools of the country. I, myself, am interested especially in the School of Agriculture and the Experiment Station, since I am to be charged with the responsibility of their development. I, however, recognize the very simple mathematical proposition that the whole is greater than any of its parts. I am also a firm believer in the proposition that the place to educate a boy or girl is where there are a number of strong schools. I do not believe in the monastery or the convent or the single course college for the education for the world's work.

I happen to know that there are a number of people who are afraid that the promotion of agriculture may prevent the proper development of other schools at State College. I am glad of the opportunity to say before official representatives of the farmers of Pennsylvania that I expect to see the other schools of State College promoted and supported by the farmers of the State just as cordially as the School of Agriculture. The School of Agriculture may grow without preventing the growth of a State institution. This may be illustrated by the University of Illinois, the growth of whose College of Agriculture I have just shown you in this table. The following table gives the total income and the total number of students in the University of Illinois:

	Income.	Students.
1897,	\$212,000	1,582
1898,	212,000	1,824
1899,	330,400	2,234
1900,	330,400	2,505
1901,	430,330	2,932
1902,	430,330	3,289
1903,	613,000	3,594
1904,	613,000	3,729
1905,	787,035	4,074
1906,	787,035	4,374

I have tried to show in the figures which I placed before you that this beautiful and flourishing State of Pennsylvania, while less of an agricultural state relative to its other industries than some others, is absolutely one of the first eight or nine agricultural states of the Union. That in gross returns for an acre of land actually tilled, its farmers lead some of the more important states. That your farmers need aid through agricultural education and research and through the executive and police powers exercised by your State Department of Agriculture does not admit of debate. While your resources are boundless, it is obvious that what you are doing to promote this great basic industry falls far short of what other states have seen fit to do. If I were speaking to a body of men who had no interest in agriculture, I might appeal to them from the standpoint of their civic pride, but before this society, officially recognized as the society which is organized to promote in every way within its power the calling of agriculture, may I not appeal to your business sagacity? Need I point out that in spending money in the promotion of agriculture, the Commonwealth is merely advancing money which will be returned to it manifold in future years?

MR. HALL: I think that the Board should express its appreciation of this paper by a rising vote of thanks.

MR. CLARK: The committee in charge of the "Dog Law" is prepared to report at any time you may wish.

The CHAIRMAN: We will be ready to listen to that report.

MR. CLARK: At any time you are prepared.

The CHAIRMAN: Right now.

The Committee on "Dog Law" thereupon made the following report:

REPORT OF COMMITTEE WITH REFERENCE TO DOG LEGISLATION.

First, we realize the dog is here to stay, and to gain control of this animal we would recommend the following means of accomplishing this end. First, that all dogs be registered and to wear a collar or tag bearing the number of said registry.

Second, to accomplish the registry, we would recommend that the first registry shall be made by the assessor when he makes his fall assessment by registering all dogs, to take a short description of the animal and issue tag or collar with number, after the owner has paid the fee of \$2.00 for each dog so registered, which shall be paid to the assessor at that time or the tag refused, and after the time of the assessor making his returns, it will be the duty of the constable to destroy all dogs not registered, and be paid for this duty \$2.00 and mileage for each dog killed and buried, and when making his reports to the Court, he shall also state that he has complied with the instructions of the Dog Law in killing all dogs not registered.

Third, as to the disposition of this tax, we recommend that this shall be left in the hands of the commissioners of each county as to what it shall be applied to.

All laws that would interfere in the carrying out legislation of this kind shall be repealed.

M. N. CLARK,
S. S. BLYHOLDER,
N. B. CRITCHFIELD.

The CHAIRMAN: What shall be done with this report?

On motion, duly seconded, the same was received and adopted.

MR. NORTON: Mr. Chairman, Ladies and Gentlemen: If you are ready to adjourn, we will be ready to start the milking machine at half past eleven. We will operate it again from four to half past four this afternoon, and from ten to half past ten this evening. Now, we will probably be crowded for space, and if you can't all get there at this time, we will be glad to see you there later.

The SECRETARY: The election of officers was to take place at this time, but it is for the Board to decide whether they want to postpone it, or proceed with the election now.

On motion, duly seconded, it was agreed to proceed with the election of officers at once.

The CHAIRMAN: Before proceeding with the election of officers, we should dispose of Prof. Hunt's paper. I should like to hear a motion in regard to it.

MR. HERR: I move that the paper be received and published with the proceedings of the Board.

This motion was duly seconded and agreed to.

The CHAIRMAN: We will now proceed with the election of officers. I shall be pleased to receive nominations. The first in order, I believe, is nominations for vice presidents.

MR. SCHWARZ: I nominate Mr. Fenstermaker.

MR. McHENRY: I wish to place in nomination the name of one of our oldest members, Joel A. Herr.

A Member: I nominate Mr. M. N. Clark.

MR. CLARK: I think you had better take my name off the list. I may not be able to serve, and therefore ask to withdraw my name.

A Member: I offer the name of Mr. E. E. Chubbuck.

MR. BARNES: I wish to nominate Geo. G. Hutchison.

MR. HERR: I nominate Mr. McClellan.

MR. FENSTERMAKER: If the Board will allow me, Mr. Schwarz has kindly mentioned my name, but I have had the honor once, and I will be glad to withdraw.

MR. SCHWARZ: I did that because I thought, since the meeting is to be held at Allentown, we should have a vice president from there.

MR. FENSTERMAKER: Not necessarily. I appreciate the motive, but if the Board will allow, I beg to withdraw my name.

MR. SCHWARZ: Inasmuch as we now have three names, I move that they be elected by acclamation.

Duly seconded and agreed to.

The Secretary was directed to cast the ballot for Messrs. Herr, Chubbuck, and McClellan as Vice Presidents.

The CHAIRMAN: Will the first Vice President please take the Chair.

MR. HERR: I don't think he begins to serve until the next meeting.

The CHAIRMAN: I think it is customary for him to take the Chair as soon as elected.

Mr. Herr thereupon took the Chair and said: "I have always taken a deep interest in the Board and I appreciate the honor you have conferred upon me. We are now ready for nominations for the Executive Committee, on which there are nine members."

The following gentlemen were nominated to serve on the Executive Committee: Messrs. Snively, Blyholder, I. A. Eschbach, Stout, Clark, Naginey, McGowan, Seamans.

MR. SCHWARZ: I move that the nominations close and we elect these gentlemen by acclamation.

Duly seconded and agreed to.

The SECRETARY: I take pleasure in casting the ballot for the election of these gentlemen.

MR. KAHLER: I would like to make this announcement: That the members of the Legislative Committee are requested to meet in the little room back there at half past one o'clock. If there is anything to come before the committee I would like to know it before that.

MR. HALL: As a member of the Board, I am not willing that the information we have received from Prof. Hunt this morning should go with so meager a recognition. It seems to me that his paper

gives us the information we needed regarding the status of this State, and I move you, sir, that a vote of thanks be extended to him and that the entire amount asked for be endorsed by this Board of Agriculture.

MR. BLYHOLDER: I think we should divide up that question. I don't think we can legally vote on the two things at the same time.

The CHAIRMAN: We will take a vote on the first part, to extend a vote of thanks to Prof. Hunt.

Agreed to.

MR. YOUNG: I think the easiest way to bring this information before the Legislature is for Prof. Hunt to go there and deliver this lecture.

The SECRETARY: Do you make a motion that Prof. Hunt be requested to go before the Legislature and deliver that lecture?

MR. YOUNG: I do.

The SECRETARY: I think the best way would be for him to go before the Appropriation Committee of both the House and the Senate, and then the members can come in and listen to it. I am afraid he would have trouble in getting a hearing right in the House.

MR. HALL: I don't want to take up all the time, but there is one practical thing all of us can do: We can go home and see the members who represent our county, and urge upon them to stand up for this appropriation, and in that way we can help the thing along.

The CHAIRMAN: That is a very good idea.

MR. NAGINEY: I would suggest that we see our county representatives before we go home. They are all here now and can easily be reached. I think it will be better for us to see them before the Professor delivers his lecture.

The CHAIRMAN: And if you can't do that, you all know how to write.

On motion, duly seconded, adjourned until 1.30 P. M.

Wednesday, January 23, 1907, 1.30 P. M.

The Convention opened this afternoon with Mr. Herr in the Chair.

The CHAIRMAN: Is the Executive Committee ready to make a report?

MR. STOUT: As one of the Committee, I can make a report if desired.

The CHAIRMAN: Mr. Stout, a member of the Executive Committee, will make the report.

REPORT OF EXECUTIVE COMMITTEE.

MR. STOUT: The Executive Committee have named the following Committees; you will notice that there are a few slight changes from the committees as they now stand. (See pages 7 and 8.)

The CHAIRMAN: The program now calls for the Report of the Committee on Floriculture, Edwin Lonsdale, Chairman. I do not see Mr. Lonsdale here. Have you his report, Mr. Secretary?

The SECRETARY: Mr. Lonsdale asked permission to send in his report a little later, and have it printed with the proceedings. What is the pleasure of the Board in regard to that?

The CHAIRMAN: What shall be done regarding Mr. Lonsdale's report?

On motion, duly seconded, it was agreed to receive the report and place it on file for publication with the proceedings of the meeting.

The CHAIRMAN: Next comes the Report of the Committee on Forestry. Is Mr. Piatt here?

It appeared that neither Mr. Piatt nor his report were there.

The CHAIRMAN: We will then go on to the next paper, the Report of the Committee on Cereals and Cereal Crops, by S. X. McClellan, Chairman.

Mr. McClellan then read his report, as follows:

REPORT OF THE COMMITTEE ON CEREALS AND CEREAL CROPS.

BY MR. S. X. MCCLELLAN, *Chairman.*

This is a subject that is worthy of more consideration than is generally given to it, as it is of vast importance to all classes of people, as the production of cereal crops is by far the greatest industry of the present day. It requires more brain, muscle and money than any other one branch of business, because it is the motive power of the nation. The corn crop for 1906 in itself will show the vast amount of revenue it produces, and that is only a part of the great industry. The total number of acres of corn in the United States for the year 1906 was 96,737,581, and the average yield per acre was 30.3 bushels, making 2,927,416,091 bushels. The average price per bushel 39.9 cents, making in all \$1,166,626,479.

Winter Wheat came next in value. The total acreage for 1906 was 25,599,961, and the average yield per acre was 16.7 bushels, making the total number of bushels 492,888,004. The average price per bushel was 68.3, making a total value of \$336,435,081. Of Spring Wheat there was 17,705,868 acres; average bushels per acre 13.7, making a total of 242,372,966; and the average price per bushel 63½ cents, making a total of \$153,897,679.

The Oats crop of 30,958,768 acres, with an average yield of $29\frac{1}{2}$ bushels per acre, making a total of 964,904,522 bushels, at an average price of 31.7 cents per bushel; total value of same being \$306,292,978 for oats alone.

Next comes Barley, there being 6,323,757 acres at an average yield of 28.3 bushels per acre, making a total of 178,916,484 bushels, at an average of $41\frac{1}{2}$ cents per bushel, making \$74,235,979 for that crop.

The next crop in value comes Rye. Now, I do not think they base their estimate on this crop from what it costs the consumer when made into whiskey and sold at from 10 cents to 15 cents per glass—and if you notice, the glasses are not as large either—but we find the total acreage to be 2,001,904 acres, making an average of 16.7 bushels per acre, which makes 33,374,833 bushels at an average of almost 60 cents per bushel, making \$19,671,243 for rye alone.

Buckwheat, considered by a large number of farmers as not a profitable crop, shows up an acreage of 789,208 acres—average bushels per acre 13.6, making a total of 14,641,737 bushels, valued at 59.6 per bushel, making \$8,727,443 worth of buckwheat.

Of Flaxseed there were 2,505,927 acres, making an average of 10 1-5 bushels per acre, or a total of 25,576,146 bushels, at an average of \$1.012 per bushel, making a sum equal to \$25,899,165. And the Rice crop shows an acreage of 575,014 acres, at an average of 31.1 bushels, making 17,854,768 bushels, at an average of 90.2 cents per bushel, making the sum of \$16,121,298.

The state that shows the largest acreage of corn is Illinois, 9,616,886 acres. The state showing the lowest number of acres is Wyoming, 2,528 acres. Ohio ranks first in number of bushels per acre, 42.6, and good old Pennsylvania third. Florida, the lowest, with 11 bushels per acre. Iowa produced the greatest number of bushels, 373,275,000, and Wyoming the lowest, 68,256 bushels. Arizona, the highest price per bushel, 85 cents. Oklahoma, the lowest, which was 30 cents per bushel. Illinois ranks first in the value of the corn crop, being a total of \$124,981,051, and Wyoming the lowest, \$40,271. Kansas leads in acreage of winter wheat, with 5,131,800 acres, and Alabama the lowest, with 1,761 acres. Idaho leads in the number of bushels per acre, which is 25.4, and North Carolina lowest, with 9.1 bushels per acre. Kansas leads in the total number of bushels, having 78,516,540, and Mississippi the lowest, with only 17,610 bushels. South Carolina shows the highest average price per bushel, with \$1.10, and Oklahoma the lowest, 55 cents per bushel.

In Spring Wheat growing states, North Dakota leads in acres, with 5,992,000, and Arizona lowest, with only 15,542 acres. Colorado has the greatest number of bushels per acre, $32\frac{1}{2}$, and Minnesota the lowest, being 10.9 per acre. North Dakota leads in the total number of bushels, having 77,896,000, Arizona lowest, with 391,658 bushels, and she also leads with the highest average price per bushel, being \$1.03, and Nebraska the lowest, at 57 cents per bushel. North Dakota leads in the total amount of dollars, with \$49,074,480, and Arizona lowest, with \$403,408 to her credit.

Oats is produced in every State and Territory of the United States. Iowa leads in the number of acres sown, with 4,165,000 acres, and Arizona lowest with only 914 acres. Utah leads in average of bushels to the acre, being 43.7 per acre, and Florida the low-

est, with 14 bushels, per acre. Iowa produced the greatest number of bushels, having 140,777,000, and Arizona the lowest, with 31,442 bushels. Florida had the highest average price per bushel, being 68 cents, and South Dakota the lowest, with 25 cents per bushel. Iowa leads in total amount of dollars, being \$38,009,790 to her credit. In the Barley growing States and Territories California leads in number of acres, with 1,425,000 acres, and New Mexico the lowest, with 556 acres. Utah leads with the highest number of bushels per acre, being 44 bushels, and New Hampshire the lowest, with 21.4 per acre. California leads in the total number of bushels, with 38,760,000, and New Mexico the lowest, with 15,072 bushels. Arizona shows the highest average price per bushel, being 76 cents, and Nebraska the lowest, with 31 cents per bushel. California leads in dollars, having \$20,930,400 to her credit, and New Mexico the lowest, having \$9,458.

All but ten of the States and Territories produce rye, Michigan having 400,000 acres, leads, and Wyoming only 428 acres. Idaho has the best average per acre, being 25 1-5 bushels. Georgia, the lowest, having only 8.2 bushels per acre. Pennsylvania leads in total number of bushels, having 6,025,011 bushels to her credit, and Wyoming the lowest, with only 8,132 bushels. South Carolina having the highest average price per bushel, being \$1.25, and Nebraska the lowest, with only 44 cents per bushel. In total value of crops Pennsylvania leads, having to her credit \$3,856,007, and Wyoming the lowest, having \$5,855 to her credit.

Buckwheat is grown in only twenty-four or twenty-five states. New York leads with 321,552 acres, and Tennessee lowest, with 527 acres. Maine has the highest average bushels per acre, being 28 bushels, and Iowa the lowest, with 12 bushels. New York has the greatest number of bushels, 6,109,488, and Tennessee the lowest, having 8,432 bushels. Tennessee also has the highest average price per bushel, being 83 cents, and Minnesota the lowest, at 54 cents per bushel. New York leads in dollars, having \$3,726,788 to her credit, and Nebraska the lowest, having \$8,007.

Flax is raised in thirteen to fifteen states. North Dakota leads, with 1,465,745 acres, and California lowest, with 1,042 acres. Wisconsin has the highest average yield of seed per acre, being 14 bushels, and Missouri lowest, with 7.3 per acre. North Dakota leads with total of 14,510,876 bushels, and California lowest, with 12,504 bushels; California and Oregon having the highest average price per bushel, \$1.25, and Idaho the lowest, with 85 cents per bushel. North Dakota leads the list with the value of \$14,801,094, and California the lowest, with \$15,630. About nine states grow rice. Louisiana leads the list, with 308,377 acres, and North Carolina the lowest, with 668 acres. Texas gave the largest yield of rough rice per acre, which is 36 bushels, and Mississippi the lowest, with 20 bushels per acre. Louisiana has the greatest number of bushels, 8,634,556, and North Carolina the lowest, with 19,305 bushels. South Carolina, Florida and Alabama have the same average price of \$1.00 per bushel, and Arkansas the lowest, at 85 cents per bushel. Louisiana has the largest total value, being \$7,771,100, and North Carolina the lowest, with \$18,340.

Taking the total value of these crops they are immense, making a grand total of \$2,107,906,860.

The CHAIRMAN: What shall be done with this report?

On motion, duly seconded, it was received and filed for publication.

The CHAIRMAN: Some of the reports have been omitted. The first of these is the report of Dr. Leonard Pearson, State Veterinarian, who is now with us, and will read his report.

Dr. Pearson's report is as follows:

REPORT OF THE VETERINARIAN.

BY Dr. LEONARD PEARSON, *Harrisburg, Pa.*

The subject of tuberculosis continues to be one of chief interest in connection with the veterinary work of the State. It is a little embarrassing, sometimes, to speak on this rather threadbare theme to this body, that has in recent years heard so much about it. But, so long as there is such need for information in respect to this disease, and I find evidence of it in my daily work, I am sure that you will not resent a brief discussion of it. While the general topic of tuberculosis is an old one, a vast number of men are making investigations in relation to its occurrence in man and animals, and so, from time to time, new facts concerning its nature and new developments in means to combat it are being brought to light.

I take it that the plan of operation of the State Livestock Sanitary Board is known to you, and it has been described in the annual reports of the Department of Agriculture. You are aware that inspections and tuberculin tests of herds are made only upon request of owners of cattle. It has been the opinion of the Board that there is no permanent advantage to the State in completely freeing herds of tuberculosis, by the use of the tuberculin test, and in undertaking a large share of the cost of such operations, if the herds are permitted soon to become reinfected. And it is quite impossible, excepting at enormous expense—by the use of much more money than is at all likely to be made available for this purpose—to keep herds free from infection unless the public authorities have the co-operation—the active assistance—of the owner. Hence, such inspections are made only upon application from herd owners. But, under a new law (No. 56, P. L., 1905), it has become possible to deal with all cases of advanced tuberculosis of cattle that are reported. Still, there is no organization for searching for such particularly dangerous animals, and I regard this the point that next requires consideration.

While we have found that the majority of farmers are alert to the importance of excluding tuberculosis cattle from their herds, and many report tuberculosis when examination shows that this disease does not exist, there are others who are so careless as to keep and use cows with advanced tuberculosis, even with tuberculous udders, and permit such cows to scatter germs of disease for months, until their entire herds become infected—to say nothing of poisoning the milk supply.

Tuberculous cows are dangerous in proportion to the number of tubercle bacilli that are escaping from their bodies. Advanced

cases of disease excrete infinitely more germs than light cases, hence the advanced cases constitute the greatest menace to the live stock industry and the public health. For the purpose of discovering and extirpating these particularly dangerous animals, a systematic inspection of dairy herds is necessary. I have been loth to recommend such an inspection, because I know how unpopular the idea of inspection is. It should be remembered, however, that it is not fair to the careful, clean dairyman to have to compete in the market with a man who has no pride in his work, or regard for the quality or wholesomeness of his product. And it is unfair to permit the worst managed herds to reach such a degraded state as to cast reflection on the whole milk supply. I feel that unbiased consideration of this suggestion must lead to the conclusion that objections to it are based chiefly on sentimental grounds.

Remember that it is not proposed to use the tuberculin test in connection with this inspection, unless it should be necessary to do so to remove doubt in relation to the condition of individual animals. To propose to test all herds with tuberculin would be absurd, and such a suggestion could not be made by any one who knows what he is talking about.

If such an inspection is provided for, the inspectors should, and no doubt would, feel that they are selected to aid, and not to oppress; to assist, and not to hamper; to co-operate, and not to oppose. It would—and I speak advisedly, and from long experience—be in the rarest case that the inspector would have to make the least show of authority. Such inspectors would be of great value to dairymen as peripatetic advisors in relation to the control of other diseases of importance, as abortion, calf cholera, infectious gargets, etc., and in relation to general questions of animal, stable and milk hygiene.

In New York State, there are a dozen or more dairy inspectors appointed by the city of New York, and a project is being considered to increase this corps to nearly one hundred. Such inspectors, appointed and paid by a city, have in mind, first and foremost, the interests of the city. The farmer is not helped by such men—unless most incidentally—and, indeed, one could scarcely expect appointees of Tammany Hall to be able to render much help to farmers, if they would.

If there is to be such an inspection, it should not be conducted by the cities, but by a department of the State government that is affiliated with the agricultural interests of the State, so that it will be with, and not against, the best agricultural sentiment. But, of course, the organization must be of such character that it will meet the very proper and growing sentiment in cities for a purer and more wholesome milk supply.

There are numerous other subjects that I might report to you, but I esteem this to be one of such importance that I wish not to obscure it by other topics. Moreover, I wish to be brief now, because I am on the program for another paper at another session. I hope this subject will receive careful consideration at the hands of this representative body.

A Member: Has there been any attempt made to vaccinate calves?

DR. PEARSON: The vaccination of calves in our experiment work has been very successful. We are now practicing it very freely on quite a number of farm herds throughout the State.

A Member: Is it a protection?

DR. PEARSON: I think it is a protection for the time, but for just how long I do not know. A German authority has stated that the protection is for life; I criticised it, and was severely criticised myself for it; I said it was ridiculous to claim that it protected for life when it had only been tried for a few years. And French tests show that the immunity expires after a certain time, and then the animal is liable to contract the disease. They have found by their experiments that the animal is usually protected for about three years. They have proven this by putting the vaccinated animals in among a herd in which there are some advanced cases of tuberculosis, and noting results, and animals that have been vaccinated for more than that length of time, and which are exposed, show decided lesions of tuberculosis. I find, however, that animals should be re-vaccinated after a period of two years. I look upon the whole treatment as exceedingly interesting and instructive, and of great importance to the farmer.

MR. VAN ALSTYNE: I would like to ask the Doctor how expensive it would be to the farmer?

DR. PEARSON: All the herds that are now being vaccinated are treated at the expense of the State.

MR. VAN ALSTYNE: Exactly what will be the cost to the farmer where the State does not pay for it?

DR. PEARSON: Well, if the Live Stock Board continues to conduct the work it will not be more expensive in the future than it is now; I do not know whether this will be done, but I think it ought to be.

MR. VAN ALSTYNE: But what will it cost the farmer now?

DR. PEARSON: It does not cost anything; the State does it for you.

MR. VAN ALSTYNE: Exactly; but if the State did not do it, what would it cost the farmer?

DR. PEARSON: I do not know what the veterinary surgeon would charge for doing the work, but that would be the chief cost.

The CHAIRMAN: Are there any further questions to ask the Veterinarian? If not, what disposition shall be made of his report?

It was regularly moved and seconded that the report be received and placed on file. Agreed to.

The CHAIRMAN: As Chairman of the Committee on Credentials, I would say that the Lancaster Agricultural Society has elected Hon. W. H. Brosius a member of the Board for the next three years, and I would move that he be elected a member of the Board.

Duly seconded, and agreed to.

The CHAIRMAN: Next we will listen to the report of the Committee on Roads and Road Laws.

Mr. Kuppenburg, Chairman of this Committee, then read the following report:

REPORT OF THE COMMITTEE ON ROADS AND ROAD LAWS.

BY MR. D. A. KNUPPENBURG, *Chairman.*

Of the many questions which confront the people of Pennsylvania today, that of road building is of vital importance. The construction of roads is governed by law, hence the necessity of wise road laws. Our present system of pathmaster and nonpaid supervisor has not been in use long enough to warrant a just judgment of its merits. It has been demonstrated, however, that supervisors enter upon their duties with little enthusiasm and marked show of disinterest.

It would seem to your Committee that the first requisite in making and maintaining a good road, would be the location of the roads with proper grades, given by a competent surveyor. Then a law to insure the road being built to the grade given; it too often happens that where a road is properly graded by a surveyor, the road is opened in the cheapest and most unsatisfactory manner, going over steep knolls, or down steep grades, to avoid a little extra expense in keeping the grade. Many country roads should be relaid; taken from bleak hilltops and kept on an easy grade. This, in nearly every case, is possible. If this were done, and the law directing the moving of stone closely observed, our highways would be in much better condition, and would well serve the public until better roads come for our use and the use of the next generation.

The government will look more carefully to the enforcement of the laws regarding the roads over which the rural free delivery is established. The present requirement is: "Roads traversed by mail carriers shall be kept in good condition and unobstructed. Bridges must be kept over creeks and streams not fordable at any season of the year." The government has decided that unless roads travelled by the carriers are properly maintained, the service will be withdrawn. The Postoffice Department now calls on the carriers for reports on the roads where the highway in question is bad. The 35,973 rural delivery carriers now employed cover 863,363 miles daily, and it is unreasonable to expect them to contend with neglected roads.

The inland country roads are primary factors in the commerce of the nation. They are to the city man, the farmer, the lumberman, what the railroad, the rivers and the high seas are to the manufacturer and the coal operator. The growth of the country has been marvellous, and we are now approaching a new era. The time has come when the country road should be made to compare with the part it plays in the nation's progress. As a business proposition we would regard it as advantageous to nearly every township to get

a good macadam road at one-eighth the cost of construction. However, if the township or county is not able to meet the expenditure without borrowing, I question the feasibility of issuing bonds for that purpose. Even though our posterity would reap benefit from such permanent improvements and would not object to sharing the cost, I should much prefer using the means within reach, rather than encumber posterity.

A change in the Act, putting the entire cost of macadam roads on the State, leaving the townships and counties free to use their means for the improvement of roads, not within reach of the State appropriation, would thus benefit those who would receive slight benefit from the macadam road. If the right policy prevails, this will be done and as much money will be available from these sources as can well be expended for the purpose from year to year. Experience shows that there is a limit to State aid, requested, and this will doubtless be the case as long as the counties and townships are requested to pay part of the cost, as small as that cost is.

The sentiment in favor of improvement has been greatly strengthened within the past three or four years. It almost amounts to a general demand, and while we cannot have \$50,000,000 (as in the case of New York State) for immediate use, the appropriation can safely, and should, be increased many millions a year. State Highway Commissioner Hunter has commenced a general survey of all the roads in Pennsylvania, for the purpose of compiling a new map, showing their length and location. As there are 99,041 miles of road in the State, it will require several years to complete the survey. According to the best authority at hand, we have 97,904 miles mtd road, and 1,101 miles of toll road, 2,267 miles of macadam road completed, 162 miles contracted. Only one county in the State that has not applied for State aid, that of Juniata.

Every other county in the State has made application for its portion of the road fund, as well as its share of the \$125,000 set aside for its maintenance. Allegheny and several other counties which asked for funds last year failed to secure their share by neglect of the County Commissioners to apply within the time limit.

Applications on file for State aid in building roads represent 2,267 miles, and of these Commissioner Hunter expects to build 200 miles this year, in addition to the 200 miles already constructed or under way. It has been decided to use part of the automobile license receipts for road building. The fund already amounts to \$24,000, and is expected to reach \$30,000 each year. The annual license fee is \$3.00.

Too much cannot be said in regard to using wide tired road wagons for hauling heavy loads. The wide tire acts as a roller on dirt roads, and entitles the user to one-fourth his road tax, not exceeding \$20.00.

To build a satisfactory earth road, if loose earth is dumped in the middle of the road and consolidated by traffic, the action of narrow tired wheels rolls it into uneven ruts and ridges, which hold water, and ultimately results, if in the winter season, in a sticky, muddy surface, or if it be in the dry season, in covering the surface with several inches of dust. If, however, the surface is prepared with a road machine and properly rolled with a heavy roller, it can usually

be made sufficiently firm and smooth to sustain the traffic without rutting, and resist the penetrating action of the water.

Every road is made smoother, harder, and better by rolling. Such rolling should be done in damp weather, or if that is not possible, the surface should be sprinkled if the soil requires such aid for its proper consolidation.

We recommend a steam road roller of sufficient size to be used for rolling the road and crushing stone. If this is not available, then a heavy road roller to be drawn by horses should be used. Also that a change be made in our present appropriation law for good roads, giving all the counties in Pennsylvania an equal right to share the benefits of the appropriation without expense to the county, thereby assisting those most in need of help.

A law providing for the payment of Two Dollars per day to Township Supervisors for a sufficient time to properly transact the necessary road business, would prove of benefit. We fail to find in our present road laws anything to compel a pathmaster to make a detailed report to the supervisor, and therefore recommend that the law make this duty compulsory.

The CHAIRMAN: Gentlemen, you have heard the Report of the Committee on Roads and Road Laws. Are there any questions that you wish to ask on that report? If not, what action will you take on it?

On motion, duly seconded, it was agreed that this report be received and placed on file.

The CHAIRMAN: We will now have the report of Prof. Surface on Entomology.

This report is as follows:

REPORT OF THE ENTOMOLOGIST.

BY PROF. H. A. SURFACE, *Economic Zoologist, Harrisburg, Pa.*

Never in the history of Pennsylvania has there been so much interest taken in insects as during the past year. The reasons for this are as follows:

1. The destructive effects of insect pests have never before been more apparent in wiping out of existence many orchards, and causing very great loss to farmers, fruit growers, and also truckers and gardeners in this State.

2. The very grave results of the accidental introduction of the Gypsy Moth and the Brown Tail Moth in Massachusetts, and the spreading of these pests into other states has called the attention of the people, as never before, to the importance of insect prevention, and we hope to be able to keep such pests out of this State by proper and careful methods. This problem is so great in Massachusetts that the amount of \$300,000 was appropriated for fighting these two pests alone, and \$30,000 additional for the study and introduction of parasites. They have now escaped into New Hampshire, Vermont, Maine, Rhode Island, and Connecticut, and are very liable to reach this State. They practically destroy every green

thing, and are so much worse than the San José Scale that there is but little comparison to be drawn between them.

3. Within the Keystone State the San Jose Scale has destroyed hundreds of thousands of dollars worth of trees and shrubs, as well as tens of thousands of dollars worth of fruits, directly, during the past year.

4. To prevent this loss, special provision was made by the Legislature two years ago, and about thirty inspectors and demonstrators have been appointed to work (part of the time during the last fourteen months) under the Division of Zoology of the Department of Agriculture, to ascertain the presence of this destructive pest, and to notify persons whose trees may be infested with it, and who may not know it; also to show them how to control it.

5. The Bulletins of the Division of Zoology have been issued as regularly as possible, bearing almost wholly on insects or their enemies, and have reached at least 50,000 readers each month.

6. The correspondence from the office of the Economic Zoologist has been very great, amounting to at least 500 letters per month; of these at least 75 per cent. are directly upon the subject of insects and other plant pests.

7. The agricultural papers and newspapers of the State are aiding in taking up the warfare against such pests, in disseminating the methods of their control.

8. The more advanced agriculturists and horticulturists are buying and using spraying machinery, and more spraying has been done in this State during the past year than in all previous years combined. Their results are satisfactory, generally, and this encourages them and others to proceed with methods which will save their trees and other plants.

9. The manufacturers of spraying apparatus and commercial insecticides are taking advantage of the needs of the day in sending considerable literature to the farmers and fruit growers over the State, and this aids in calling attention to the importance of insecticidal work.

10. The high price of fruits and the certainty of controlling such pests as the Scale insects have combined to induce persons to plant young orchards, and nurserymen tell us that during the past year they have had unusual sales of fruit trees for starting orchards in this State.

These influences have combined to call the attention of the public to the insect pests and the possibility of controlling them in a satisfactory, effective and cheap manner, and producing first-class fruits even though a few pests be present.

We believe it possible to obtain a fair view of the subject of insects in Pennsylvania during the past year by running through the list of specimens received in the office of the Economic Zoologist. Over 5,000 different collections have been made or received, and all of these have been classified and studied. We find the San José Scale to be, of course, the chief insect sent us, and the one of which most inquiry has been made. In the bulletins of the State Zoologist for February, July, November, and December, of 1906, special attention has been given to the San José Scale and its remedies, and from the experiments there outlined, as well as from written reports from practical fruit growers in many portions of the State,

it is shown that the best and cheapest remedy for this pest is the boiled lime-sulphur wash, which should be boiled at least one hour. These experiments show that the addition of salt has not been necessary, and even some injurious results may come to twigs and buds of peach trees when applied during the fall or winter, with the salt added. Since these bulletins are for free distribution, it is not necessary to dwell at length upon this subject. However, it should be added that the tests of the commercial insecticides have been made with practically the same results that have been obtained in other states, viz: that some of these materials are effective in killing the scale when applied strong enough to have the desired effect, but they should be stronger than claimed by manufacturers and agents, or (for two or three of the leading brands) one part to ten, or at most fifteen parts of water, instead of one to twenty, as claimed by the manufacturers and agents.

To avoid the appearance of personal interest in this regard, we advise each person to try a little of such material for himself, and thus, by practical experience, learn the results on his own trees, but to depend upon the cheaper standard or home-made remedies for saving most of his trees until he is well satisfied that he can control the scale in a satisfactory and inexpensive manner by the use of the so-called miscible oils or soluble oils or other commercial insecticides.

In this connection it should be said that the whale-oil soap, two pounds in one gallon of water, applied as a spray or thorough wash in the spring before the buds burst, will have excellent results in killing all pests on the trees, but will not be found as cheap as the lime-sulphur wash, and the latter is also a germicide and fungicide as well as insecticide. The great objection to the lime-sulphur wash is the trouble with clogging nozzles, which can be overcome by straining through a conical wire strainer set in a funnel, as shown by the funnel here exhibited.

Unfortunately, it appears that the San José Scale is here to stay, and cannot be exterminated, yet it can be controlled, and encouragement should be found in the experience of hundreds of persons whose names and addresses we can give, who are satisfied with the results of their spraying. We believe it very important that a study of the enemies of these pests should be made, and, if possible, to develop or propagate parasites. The attempt will be worth a great deal to the agricultural interests of this State.

To aid in disseminating practical information concerning scale insects, we have prepared some models showing such pests greatly enlarged, in natural colors and forms, which are used in meetings where these subjects are discussed. I exhibit them here:

Oyster-shell Scale.—The Oyster-shell Scale stands next in regard to numbers of specimens sent to the office of the Zoologist and inquiries made. This is quite different from the San José Scale as shown by these models, but it is too often confused with it by persons who know neither. Our experiments have shown that it is killed by early spraying, using the lime-sulphur wash before the buds burst, just as for the San José Scale. Practical results have been obtained in this way for this pest by our experiments, as well as by fruit growers, such as Hon. H. E. Little, Tunkhannock, Pa., and Mr. Van Busick, of Erie county, who reported this to us.

Scurfy Scale.—The Scurfy Scale stands next in the attention given these pests of fruit growers, and is often mistaken for the more serious San José. However, it is easily distinguished according to the specimens shown, and is controlled or exterminated by many of the good remedies for the San José.

Lecanium.—The fourth common scale insect in this State is the Lecanium, also called Soft Scale and Turtle-shell Scale. In some parts of the State it is very destructive to peach and plum, while another species has commonly been reported upon the magnolia and tulip trees.

Among insects which have attracted the attention of the growers of plants, are various kinds of Aphids or plant lice, which have a host of enemies holding them in check, and which are to be destroyed by comparatively mild contact insecticides, such as whale-oil soap, one pound in six gallons of water, or soft soap, or common laundry soap, one pound in about three gallons of water.

The Woolly Aphis belongs to the same family as the Green Aphis and Brown Aphis. It works on the roots of plants as well as on the branches, especially where the bark of either root or branch has been injured. On the roots use tobacco dust abundantly worked in around them, and upon the bark use any of the strong contact insecticides, such as a wash of soap solution made as thick as paint.

Unusual numbers of katydid eggs have been sent to us with the supposition that they were scale insects of some kind. The specimen exhibited was received yesterday, showing the eggs attached to a wire; as a rule they are attached to small twigs of trees or shrub. Please note that practically all of these eggs are punctured with holes of parasites, showing the beneficial effects of parasitic insects in keeping in check what might become a very serious pest.

During the past years we have had an outbreak of the Seventeen-year Locust or Cicada, especially throughout the central part of the State, from Montour and Columbia counties, southwestward through the mountainous country, reaching across into Bedford, Blair and Cambria counties, and including several other counties in that region not here named. A small area of infestation by this pest also occurred in the eastern part of the State, in Berks, Schuylkill, Bucks and Montgomery counties, and possibly some adjacent regions. Of course, their injury was made only by piercing branches to lay their eggs.

The Canker Worm has appeared in great numbers during the past two or three years, from the central to the extreme western portions of this State. However, last year their parasites were sufficiently numerous to control them in some of the extremely western counties, like Beaver and Lawrence, and consequently they did not appear there this year in such destructive numbers. A peculiar feature of this Canker Worm outbreak is, that the pest was really the Fall Canker Worm, but it had the habits of a quite different species, known as the Spring Canker Worm, in ascending the trees and laying its eggs in the spring of the year instead of in the fall. Our experiments show that banding to prevent the female climbing trees can be made effective if properly done and given close attention, but in the hands of many persons the bands were neglected, and as soon as the conditions became favorable, she passed over the bands and laid her eggs, and, unfortunately, banding was con-

demned because of imperfect methods, just as spraying is often condemned for exactly the same reason.

Let me here pause to state that we have made a special study of the causes of failure in spraying, and find that in almost all cases this is due to lack of thorough application to absolutely all parts of the infested trees and from all sides.

It was found possible to control and kill the Canker Worm by spraying with arsenical poisons, such as Paris Green, one pound in a hundred gallons of water, or Arsenate of Lead, about three pounds in a hundred gallons of water, being especially careful to apply all these remedies as soon as the young hatched and commenced to feed. After they become large, they are very difficult to kill.

The Bag Worm is a common pest on fruit and shade trees in the southern portions of this State, and is especially injurious to cedar, arbor vitae, etc., where it often is not observed. It is easily destroyed by picking by hand and burning, or by spraying with arsenites at the proper time. It is interesting to know that we have had specimens of this sent to us with the supposition that it might be the San José Scale.

The Mediterranean Flour Moth has proven exceedingly destructive in mills and other places where it is stored, but has been effectively destroyed by fumigating with Hydrocyanic Acid Gas.

Within the past few weeks there have been unusual reports of grain weevil of various kinds attacking wheat, corn, and other stored grain, but especially wheat. These are to be controlled by fumigation with Carbon Bi-sulphide, in a closed vessel or bin, putting the liquid into a shallow dish, using one pound to one hundred bushels of the grain, and covering it with wet blankets to keep the fumes down. These are heavier than air, and penetrate to the bottom of the bin. We are pushing experiments at this time for detailed information on this very important subject.

The Anguinois Grain Moth has proven exceedingly destructive to grain, both in the sheaf and in the bin, especially in the southeastern quarter of this State. It is best destroyed by threshing the grain early, and then fumigating it. Reports have come of great destruction to grain which was threshed late, while other grain in the same field, which was threshed early, was not injured.

The Peach-tree Borer is a pest which has been the subject of our experiments, and we have published how to destroy it without the necessity of cutting, by the application of one quart of boiling hot solution of concentrated lye, one ounce in a gallon of water. Pour a quart of this around the base of each tree during the month of August.

The Chestnut Weevil is the one pest in the way of successful and profitable chestnut production in this State. This becomes very important. The larva and an adult beetle are here shown. We have recently experimented in cold storage for this pest, and we found that chestnuts stored at a temperature of twenty-four degrees were ruined by freezing, but those at thirty-two degrees were in good condition after two months of storage, and all the larvae were killed. It is possible that we may find means of controlling these pests, but scientists have not yet succeeded in this. It must be the subject of further investigation, both by the State and Federal Government.

Finally, parasitic insects must have more attention than they have been given. Efforts have been made to introduce the Preying Mantis into different parts of this State in order that it can result in good by feeding upon insect pests, as it is now doing in the vicinity of Philadelphia, where it has been accidentally but successfully introduced, and is rapidly multiplying. The Lady Beetles deserve attention, and should be studied, preserved and propagated, and if this can be made practical they should be disseminated to infested plants over the State. The same can be said of the thousands of species of internal parasites which are really the chief factors in keeping insect pests in control. Unfortunately, scientists know but little of the real life habits of parasitic insects, and the practical agriculturist knows less. It is a subject of which we should know more, and which should be put upon a practical basis.

In conclusion, let us all co-operate in these important lines of study by sending specimens of insects and reports of incipient insect outbreaks to the State Experiment Station and the State Department of Agriculture, and receive the aid which the State can give from these various sources. More education and advancement is needed in this line, as well as in many others, and we hope to see it pushed successfully for those who need help.

The CHAIRMAN: What action will be taken on this report, or have you any questions?

On motion, duly seconded, it was agreed to receive the report and place it on file.

The CHAIRMAN: Prof. Menges is also to report on this subject. We are ready to listen to him.

PROF. MENGES: I have no report to make; I believe Prof. Surface's paper about covers the question, and as you are pressed for time, I will ask to be excused.

The CHAIRMAN: While we should be glad to hear from Prof. Menges, I suppose we will have to comply with his request, and excuse him. We will, therefore, proceed with the next number on the program, the Report of Committee on Dairy and Dairy Products by R. J. Weld.

This report is as follows:

REPORT OF COMMITTEE ON DAIRYING AND DAIRY PRODUCTS.

BY MR. R. J. WELD, *Chairman*.

At our last annual meeting, Prof. Thos. Shaw stated "that there existed a direct relation between the amount of live stock kept on the farms of the country and a profit that may be derived from those farms." By reason of its geographical position, its large consuming population and its nearness to the great seaboard markets, Pennsylvania is peculiarly situated with reference to one branch of live

stock production, namely, dairy farming. The keeping of cows is universal throughout the State, from the resident of the city or town who keeps one or two cows, to the larger commercial dairies where milk, cream or butter is produced for the market.

While prices of dairy products have ranged even higher this past year than in 1905, much dairy stock has been sold and taken out of the northwestern part of the State. There are two reasons for this: (1) Coarse feeds are short in quantity owing to the mid-summer drouth, and mill feeds are high in price. (2) Help on the farms is scarce and hard to secure. These two conditions make it necessary for the farmer in some sections to reduce his live stock to such proportions as he can handle himself.

The average yield of butter fat per cow per year in Pennsylvania is placed at 160 pounds. Recently I had the privilege of inspecting a herd where the average yield for the past six years has been 260 pounds of butter fat per cow. This difference was brought about by the process of weeding out the unprofitable cows. This process simply calls for the daily weighing of each cow's milk and the monthly testing of that milk by the Babcock test and close attention to feeding and management of the herd. From my own experience I am satisfied that if every farmer would only daily weigh each cow's milk and throw out the lowest producers in his herd, he would reap a benefit sufficient to pay him for his outlay and trouble. With the cost of keeping cows in Pennsylvania at from \$28 to \$32 per year, the margin of profit on some cows is not very large, and we, as business farmers, must apply the common business rule of eliminating the unprofitable elements. Just in this connection, Prof. H. E. Van Norman has been making some investigations in Central Pennsylvania as to the relations existing on some farms between the cost of feed given to the cows and the returns in butter fat. On one farm the farmer was getting ninety-nine cents worth of butter fat for every dollar's worth of feed given to the cows, while on another farm, not two miles distant, the farmer received \$1.79 worth of butter fat for every dollar's worth of feed given. At the college creamery five of the college cows returned as much to their owners as nine of the patrons' cows. These facts only further illustrate the necessity of dairy farmers to pursue their business with strict business-like methods.

In preparing this report, I sent out a list of questions to fourteen members of the Board in different parts of the State. Twelve of these sent replies. Of these twelve, seven report that the keeping of dairy cows is on the increase, while the other five are from the northern and western parts of the State, where dairying has been pushed hard for sometime so that the farms are already well stocked. All report a favorable and profitable season. More than half of the reports state that the dairymen are inclined to take their milk to the creamery or factory. One-half of the reports state that the consumers of butter prefer dairy butter to the creamery product.

To me, the answers to the last two questions, namely: "Are farmers inclined to manufacture their dairy products at home or send the milk to the factory?" and "Does the consumer prefer home-made butter to creamery butter?" point out some needed reforms in dairy husbandry. The dairyman will take his milk to the factory

where an honest efficient factoryman is in charge and where all patrons understand and practice the rules of good wholesome milk production, so that the standard of the goods from the concern will be well up. The consumer of dairy products demands a uniform, wholesome, attractive article which carries with it a guarantee of production under good sanitary conditions.

In some instances the business-like private dairyman has the advantage over the creamery, whose patrons do not appreciate all the responsibility that rests on them. One of the reasons for the average production of our State being so low is the fact that 83 per cent. of the reports sent to me state that either scrub or dual purpose animals are being kept. This condition may be remedied by the use of the pure bred dairy sires. With the exception of Bradford, Centre, Clarion and Potter counties, all the other sections which reported to me state that the shipping of milk to the cities is on the increase. This relieves the butter and cheese markets somewhat and stimulates prices of these two articles. Milking machines are in practical operation in at least two sections, and their workings will be watched with interest by many dairymen.

Legislation is suggested looking to the sanitary oversight of all places where milk is produced, handled or manufactured, also looking to the safeguarding of the operating and accuracy of the Babcock test where it is used to apportion dividends in the purchase of milk, and also for the starting of field instruction or traveling instruction under the direction of the dairy department of the State College by men who will help the butter and cheese makers with their difficulties and the dairymen in improving his conditions and herds.

In closing, it is interesting to note that with the erection of cold storage plants in our smaller cities and boroughs, some dairymen are making a practice of placing their surplus product during the flush season in cold storage, to be taken out later when needed. It seems reasonable to expect the best results from this practice, when only first-class butter, put up in good, tight, well-made packages, is used, and the same placed in cold storage immediately after making. The charges in our section for storage are small, and, so far as I know, the results are satisfactory.

The CHAIRMAN: What shall be done with this report?

Regularly moved and seconded that it be received and placed on file. Agreed to.

The CHAIRMAN: Next comes the Report of the Committee on Feeding Stuffs, by Prof. F. D. Fuller.

Prof. Fuller's paper was as follows:

REPORT OF THE COMMITTEE ON FEEDING STUFFS.

BY PROF. F. D. FULLER, *Chairman*.

The question of the selection of commercial feeding stuffs is one which is occupying the attention of practically every farmer in Pennsylvania at this season of the year. Very few, especially those engaged in dairying, produce all the grain necessary to make a balanced ration for the winter months, and in order to supplement the

home raised food with materials of a highly nitrogenous character, it is necessary to purchase standard articles like cottonseed and linseed meals, brewers' and distillers' grains, gluten meal and feed, wheat bran, middlings and other by-products.

Feeds of this nature will continue to occupy a place in the ration for dairy animals as they have in the past. At the same time, the consumer is beset on every hand with new feeding stuffs—new in name if not in kind. • As the result of the close competition between manufacturers and the more complete utilization of by-products, especially those from the manufacture of breakfast foods, we find on the market a large number of cheap articles, goods which have been adulterated or in which low-grade materials have been used in the place of standard articles.

Right here we insert a word of caution in regard to purchasing such materials as "oat feeds," "corn and oat feeds," "mixed feeds," certain kinds of "chop," etc., in which we find a large proportion of light oats and oat hulls.

The feeding value of the above mentioned articles decreases according to the extent of the adulteration with oat hulls, although, as a rule, the retail prices are practically the same as the price of a mixture of corn and oats. Oat hulls contain on the average 30 per cent. of crude fibre, which in most feeding stuffs is of no more value to dairy animals than saw dust. It is, to be sure, broken down to some extent by the animal and yields up a certain amount of its force in the form of heat, but a feed having a high fibre content contains less of the valuable food materials in a more difficultly digestible condition than if the feed contained a small or moderate percentage of fibre.

There are many oat feeds on the market which contain from 25 to 30 per cent. of crude fibre and 6 per cent. of crude protein, which are expensive at almost any price, and we desire to emphasize the fact that as long as the farmer can raise plenty of corn, oats and hay, he cannot afford to purchase any feeding stuffs containing less than 14 per cent. of crude protein.

Protein is a term which includes all the nitrogenous compounds of a feed, regardless of their nature. In everyday life we deal with materials which resemble protein substances, namely, white of egg, casein of milk, lean meat, gelatin, etc., and the animal uses the protein of the food to make these important substances, to restore the waste of tissues and muscles, which occurs at all time, and also uses it to form flesh. Protein is a very necessary ingredient for the farmer to purchase. As protein builds up the animal, so do the carbo-hydrates—sugars, starches and fats—furnish the fuel to keep the animal mechanism in good working condition.

Probably the most popular of all commercial feeding stuffs are the offal from wheat in the manufacture of flour. They consist of particular portions of the wheat kernel and are represented on the market by the bran, middlings, bran and middlings mixed and "red dog" flour. The quality of wheat by-products found on the market at the present time is very good. Samples secured in the open market during 1906 show a high percentage of protein and fat, a state of affairs which did not exist one year ago. The most common adulterant of wheat bran at the present time is probably ground corn cob. This finely ground material is sometimes mixed with bran

and the mixture sold as pure bran, while more often we find it sold as "mixed feed" with some proprietary name attached. Within the past ten days we have analyzed such a mixture, manufactured in a Western state, and retailed in a neighboring city for \$25 per ton. The manufacturers guaranteed the mixture to contain 12.05 per cent. of protein and 3.2 per cent. of fat, and analysis showed that the company guaranteed the material correctly. To the untutored eye, the mixture resembles bran and middlings, and undoubtedly the manufacturers find a ready market, although selling it with low guarantees for protein and fat.

The point which we wish to bring out at this time is that it is important for the consumer to be thoroughly familiar with the average composition of the principal feeds on the market, so that when he sees a mixture which resembles wheat bran and middlings, for instance, guaranteed to contain only three-quarters of the amount of protein that a mixture of pure bran and middlings should contain, he will readily look upon such a feed as suspicious. I am sure no one present can afford to buy a mixture of wheat bran and corn cob, especially at \$25 per ton. We were of the opinion that our feeding stuffs law, which has been so effective in correcting many evils regarding the manufacture and sale of commercial feeding stuffs, should be so amended that it will be a misdemeanor to sell a mixture of wheat bran and corn cob as "mixed feed," or, to put it concisely, the dealer "should state what he sells and sell what he states." We believe that the feed situation in the Commonwealth would be much improved and the dairymen, especially, greatly benefited if our law required that the component parts of a mixed feed should be plainly stamped on the outside of the package in which it is sold, or if sold in bulk or in sacks belonging to the purchaser, a similar statement should be furnished upon his request.

There seems to be much difficulty in maintaining the guarantees for certain feeds composed of molasses and various by-products, but the manufacturer should know the analysis of his finished product, and knowing this, he can place a proper guarantee upon it. Until a feed is manufactured which contains the guaranteed percentage of valuable food ingredients, farmers and dairymen in particular cannot put the confidence in many of the feeds on the market to which they should be entitled. Molasses feeds are palatable and nutritious and good results are apparently secured in using them.

Within the past year many new feeds, composed largely of alfalfa meal, have found their way into our State. We believe that it is poor economy for the farmer to pay a large price not only for the alfalfa, but for having it ground for him when the same material can be produced on the farm at much less expense. Since wheat bran is somewhat more valuable than alfalfa hay, ton for ton, we cannot recommend these feeds at the prevailing prices.

Time will not allow us to touch upon the standard goods, such as cottonseed meal, linseed meal, distillery and brewery by-products, except to say that these articles can usually be depended upon. They are seldom adulterated, the guarantees are usually maintained and they furnish the necessary protein for the least expenditure of money.

There is a class of articles on the market concerning which much

could be said that is not especially complimentary. I refer to the so-called "condimental" and "medicinal" stock foods, the principal ingredient of which is cottonseed or linseed meal, wheat offal or other common feeding stuff, to which is added such articles as charcoal, sulphur, ginger, Epsom and Glauber's salts, Venetian red, gentian, anise, fenugreek, etc., apparently for medicinal effect. I wish to repeat what I have already published in regard to these goods that such mixtures are worth about \$30 per ton for food purposes and the retail prices vary from \$70 to \$500 or over per ton. Suffice it to say that under no circumstances can the farmer afford to buy such foods at the prices asked. A well animal does not need them, and if it is sick the services of a veterinarian should be secured rather than depend upon the drugs supplied by condimental stock foods. It remains for the farmers and breeders of Pennsylvania to say that they will not be deceived and robbed by these condimental preparations. If domestic animals need a tonic one can be prepared for a few cents which will answer the purpose. The only way to clear the market of such articles is to create a sentiment against them and your influence can be felt all over the State. As long as there is a demand for them, just so long will the supply be maintained, for there is enormous profit in their sale.

The State feeding stuffs law requires that practically all feeds must be guaranteed to contain certain percentages of protein and fat and we advise the farmer to purchase only guaranteed articles. Examine carefully whatever you buy and if there is any doubt in your mind as to its value, do not purchase. Although we have in this brief report touched some of the poor goods offered for sale, we are glad to report that there are on the market a large variety of feeding stuffs of good quality from which the farmer should have no difficulty in selecting those best suited to his need, remembering to purchase only high grade goods to supplement the crops grown on the farm.

It gives us great pleasure to say that owing to the rigid enforcement of the feeding stuffs law by the Department of Agriculture, goods are being more generally guaranteed, high guarantees are being lowered to conform to actual analysis and many spurious feeds are being driven from the market, thereby placing it in good condition and saving thousands of dollars to the farmers of the Commonwealth.

Mr. Herr having temporarily left the room, Mr. Chubbuck took the Chair for the remaining part of the afternoon session.

The CHAIRMAN: What is your pleasure, gentlemen, in regard to this report?

On motion, duly seconded, it was agreed to receive this report and place it on file.

MR. SCHWARZ: I move that the discussion of the foregoing reports be postponed for a while until we hear Prof. Hopkins' paper.

Seconded and agreed to.

The CHAIRMAN: We shall now have the pleasure of listening to Prof. Hopkins, of the Illinois State University.

Prof. Hopkins then read his report, as follows:

LAND RUIN COMPARED WITH SOIL IMPROVEMENT.

BY PROF. CYRIL G. HOPKINS, *University of Illinois, Urbana, Ill.*

To permanently maintain profitable systems of agriculture is the most important material problem of the United States, not only because agriculture must be self-supporting, but because every other important industry in America depends upon agriculture for support. Every form of agriculture rests, first of all, upon the fertility of the soil, whether it be grain farming, fruit growing, market gardening or live stock husbandry.

In our present prosperity and abundance we almost forget the latest famine in Russia; can scarcely realize that much of the time more people are hungry in India than live in the United States; and will not remember tomorrow President's call of today for help to relieve the widespread famine now existing in China. Meanwhile we go on, as a people, ignorantly, carelessly or wantonly robbing the soil of its fertility and American posterity and our children of a rightful heritage.

Among all the nations of the earth the United States stands first in the rapidity of soil exhaustion. The improvement of seed, the use of tile drainage, the invention and immediate adoption of labor saving agricultural machinery, the wonderful development of cheap and rapid means of transportation, and the opening of the world's markets to the American farmer have all combined to make possible and to encourage the rapid depletion of American soils, until practical agricultural ruin already exists over vast areas in the older parts of this new country—the United States of America; while it is common knowledge even in new rich states of the Central West that the lands that have been under cultivation for half or three-quarters of a century are much less productive now than they once were.

The almost universal practice of the civilized world to this date has been to ruin land and then to seek out newer lands on which to repeat the process even more quickly.

What have been the common systems of land ruin? First, beginning with the virgin soil, we crop continuously with corn and small grains till the reduced yields render the system unprofitable. Next we introduce clover into the rotation and thus secure from the air not sufficient nitrogen to meet the needs of the crops grown in the rotation, but only sufficient to supplement what can still be taken from the soil by succeeding crops.

But the fixation of nitrogen is not the only function of clover, nor indeed its most effective function on many soils. Clover is a gross feeder on phosphorus and potassium, and on soils deficient in one or both of these elements clover serves as a most powerful element to deplete the soil of mineral plant food, not only by removing what it needs for its own growth, but also by its powers, as its residues decay, to liberate additional amounts of mineral plant food

for the use of succeeding crops of grain or grass. This practice may be continued until the clover system fails, clover itself, used as a soil stimulant, being the first crop to fail. Clover failure may result from several different causes. If grown too frequently on the land, it is quite probable that clover sickness may develop, although it still remains to be proven whether clover sickness is a fact. On some lands clover may fail because of the development of soil acidity; but the most common cause of clover failure that I have noted on land that has grown clover well in former years is the lack of sufficient mineral plant food in available form.

After the failure of the clover system of grain farming, we may make use of still more powerful soil stimulants, as land-plaster, or heavy applications of caustic lime, not applied merely in sufficient amount for what we might call the legitimate purpose of correcting soil acidity, but rather for the purpose of forcing the soil to give up larger amounts of plant food than it would otherwise furnish.

After this system fails, we next turn to the ordinary complete commercial fertilizer system, in which we apply not sufficient plant food to meet the needs of the crops grown, but only enough to supplement that which can still be forced from the soil. Of course the effect of this system is to make the land poorer and poorer until the soil furnishes so little and so much fertilizer is required for the moderate or meager crops produced that the business becomes unprofitable and not infrequently the land is then abandoned for agricultural purposes.

Shall we call this soil exhausted? No, it is not exhausted. No soils ever become exhausted, not absolutely devoid of plant food, and no soils ever become so completely ruined that they cannot be restored by some system of improvement. Just what system should be adopted will depend largely upon the character of the soil. If nitrogen is the only element whose total supply is so greatly depleted as to render the land unprofitable for cropping, and if the organic matter in which the nitrogen was stored has become so reduced that the mineral matter is not made available in sufficient amounts for profitable crops even though the total supply in the soil may be large, then the productive capacity of the land can be restored by storing the soil with decaying organic matter rich in nitrogen. This is most likely to be the condition on sloping hill land whose subsoil is rich in mineral plant food and whose surface soil is washed away at least as rapidly as the plant food is removed by the crops.

If, however, the total supply of phosphorus has become so deficient that sufficient amounts cannot be liberated to meet the needs of maximum profitable crops, which is likely to be the case with many upland soils of level, or nearly level, topography, then that element should be restored in liberal amounts in order to bring back the power of the soil to grow clover as well as other crops. If both phosphorus and nitrogen are deficient, then phosphorus and nitrogen should be returned. And if potassium is so lacking in the soil that liberal supplies of decaying organic matter cannot liberate sufficient potassium for large crops, a condition sometimes though rarely found, then certainly potassium should be supplied.

You may ask: How is one to know about the total supply of nitrogen and of phosphorus and of potassium contained in the various soils of the State? What soils are acid, and how acid; and what are

the peculiar difficulties with some peculiar soils? I cannot answer these questions better than by saying that the people of Illinois have made it the duty of their Agricultural Experiment Station to make a complete survey of the soils of the state, including not only the mapping in practical detail of all the soils found, but also the analysis of representative samples from every type of soil, supported by actual field experiments on all important types, so that when the work is completed every farmer may know the type or types of soil on his farm, and the average composition of each type of soil, and also the results obtained from different systems of soil treatment. The total expense of doing this work for the whole state, including the operation of soil experiment fields for many years on the most important soils in every section of the state—the total expense for this work will probably be no greater than the cost to Illinois of exhibiting her products at the Chicago and St. Louis expositions.

I accepted an invitation to speak to Pennsylvania farmers with the definite understanding on the part of your officers that I am not qualified to discuss Pennsylvania soils; but I am to try to discuss the materials and the methods to be used in soil improvement.

Farm manure has always been, and without doubt always will be, the principal material used in maintaining the fertility of the soil; but it is an unquestionable fact that the greatest source of loss to American agriculture today is in the enormous waste of farm manure.

If corn were worth \$1.05 a bushel, then the average annual value of the corn crop in the United States for the past ten years, including 1906, would be equal to the average value of the total farm manure annually produced in this country. This statement is based upon the careful estimates of the United States Department of Agriculture, placing the average annual corn crop at nearly two and a quarter billion bushels, and the average value of the manure annually produced by twenty million horses and mules, sixty-one million cattle, forty-seven million hogs, and fifty-two million sheep at more than two and one-third billion dollars.

The evidence is sufficient to fully justify the conclusion, and practical observing farmers will agree, that at least one-third of the manure produced is wasted on the average American farm. If this is true, then the total value per annum of all commercial fertilizers used in the United States (amounting to about seventy-five million dollars) is equal to only one-tenth of the annual waste of farm manure. This is no argument against the intelligent and profitable use of commercial plant food by those who make and save and use farm manure to the greatest practicable extent, but it serves only to emphasize the tremendous loss to the country from the waste that is permitted.

The value of farm manure can be, and has been, determined by two entirely different methods.

First, the manure may be analyzed chemically to ascertain the kinds and amounts of plant food it contains, and its value then computed from the cost of the same amounts of these plant food elements if purchased in the world's markets in commercial form.

Second, the manure may be applied to the land in a series of soil experiments where a suitable crop rotation is practicable, and its

value determined by computing from the value of the increase which it produces in the different crops.

The plant food in a ton of manure varies greatly with the materials used for feed and bedding. Thus, wheat straw contains per ton about ten pounds of nitrogen, two pounds of phosphorus and seventeen pounds of potassium; while clover hay contains about forty pounds of nitrogen, five pounds of phosphorus and thirty pounds of potassium. At fifteen cents a pound for nitrogen, twelve cents for phosphorus and six cents for potassium, the value of these elements is \$2.76 a ton of wheat straw, \$5.40 in timothy hay, \$8.40 in clover hay and \$9.42 in a ton of alfalfa hay.

The following facts may well be kept in mind:

1. In grain crops about two-thirds of the nitrogen, three-fourths of the phosphorus and one-fourth of the potassium required for the crop will be contained in the grain, while about one-third of the nitrogen, one-fourth of the phosphorus and three-fourths of the potassium required for the crop will be found in the straw or stalks.

2. In nitrogen and phosphorus, clover and other legume crops are about as rich as grains, nearly twice as rich as timothy or red top and more than twice as rich as straw or stalks.

3. When crops are fed to live stock about three-fourths of the nitrogen, three-fourths of the phosphorus and practically all of the potassium contained in the feed will be returned in the solid and liquid manure, the animals retaining only about one-fourth of the nitrogen and one-fourth of the phosphorus, as a general average.

From these facts it becomes very plain that the quality or richness of manure must depend very largely upon the kind of feed used.

The value of a given supply of manure varies greatly with the exposure it suffers under weather conditions.

If ordinary fresh farm manure contains ten pounds of nitrogen, two pounds of phosphorus and ten pounds of potassium per ton of manure with a dry matter basis of 25 per cent. (and 75 per cent. water), the manure that will result from holding such fresh manure until it becomes more or less rotted will vary greatly in composition, depending upon the conditions to which it is subjected.

If the fresh manure is exposed for a few weeks to the leaching of heavy rains, half of the nitrogen and potassium may be leached out, while smaller losses of phosphorus and dry matter occur, so that a full ton of the resulting manure, in which the urine (which usually contains about half the nitrogen and potassium) has been replaced by rain water, may contain only six pounds of nitrogen, two pounds of phosphorus and six pounds of potassium. This difference of four pounds each of nitrogen and potassium does not represent the total loss, because if the pile contained ten tons of fresh manure there will be left perhaps only eight tons of the leached manure, even with the same percentages of dry matter and water.

If, however, the pile of manure suffers less from leaching but more from fermentation and heating for several months, the loss of dry matter and nitrogen will be great, while the loss of phosphorus and potassium will be less. Rotted manure produced in this way is usually richer per ton than fresh manure, but the total amount of manure has been so reduced that the loss is very great.

These simple principles should be kept in mind:

1. In leaching fresh manure there are great losses of nitrogen and potassium and moderate losses of phosphorus and organic matter, the materials lost being carried away in the leach water.

2. In fermentation and heating there are great losses of nitrogen and organic matter in volatile products which escape into the air, but if no leaching occurs there is no loss of phosphorus or potassium.

In an exact experiment conducted at Cornell University, 4,000 pounds of ordinary manure from the horse stable, worth \$2.74 per ton for the plant food it contained, were exposed in a pile out of doors from April 25 to September 22 (about five months), but at the end of that time the total weight decreased from 4,000 to 1,730 pounds, and that was worth only \$2.34 instead of \$2.74 per ton. In other words, the value of this pile of manure was reduced from \$5.48 to \$2.03 during the five months exposure. In another experiment manure exposed for six months lost 56 per cent. of its dry matter and 43 per cent. of its plant food value. In this case the fresh manure was worth \$2.27 a ton, while the rotted manure was worth \$3.01 a ton, but the loss in total weight and plant food was such that for each ton originally worth \$2.27 there remained only \$1.30 worth after six months' exposure.

The plant food in a ton of manure varies somewhat with the kind of live stock. Thus, young, growing animals and animals giving milk will retain a larger proportion of the nitrogen and phosphorus than fattening stock, work horses or other mature animals. On the other hand, it is well understood that the difference in value commonly recognized and most frequently considered, as, for example,, between sheep manure and horse manure, are due almost entirely to the difference in water content. As a matter of fact, manure from work horses or from fattening steers fed on clover hay and heavy grain rations is fully as rich as sheep manure if both are reduced to the same percentage of dry matter. Of course, sheep manure containing only 60 per cent. of water, is twice as rich as cattle manure containing 80 per cent. of water.

Average fresh cattle or horse manure, made from clover and timothy hay and some grain, with sufficient straw bedding to absorb and retain the liquid manure, will contain per ton of manure about ten pounds of nitrogen, two pounds of phosphorus and ten pounds of potassium, on the basis of 25 per cent. of dry matter. Computed at the present market values for these elements—15 cents a pound for nitrogen, 12 cents for phosphorus and 6 cents for potassium—such manure would be valued at \$2.34 a ton.

Some will argue that the plant food in farm manure is not so readily available and consequently should not be valued so highly as that in commercial form, but experiments show that when a series of years is considered the farm manure may be worth about as much as the commercial materials on the basis of plant food content. Thus, at the Rothamsted Experiment Station, an application of 14 tons of farm manure, furnishing, according to the above averages, about 140 pounds of nitrogen, 28 pounds of phosphorus and 140 pounds of potassium, per acre per annum, has maintained the yield of wheat at 35.6 bushels per acre, as an average of fifty years; while an average yield of 36.9 has been maintained during the same years by an application of commercial plant food furnishing 129 pounds of

nitrogen, 27 pounds of phosphorus and 84 pounds of potassium per acre per annum.

If we disregard potassium (which is not very important because of the richness of Rothamsted soil in that element) the amounts of plant food applied and the average yields produced during half a century are not markedly different. The yield of the fertilized plot averages 1.3 bushels higher during the fifty years, but .7 bushel lower during the last ten years than the manured plot.

It is a very common and very erroneous belief that crop rotation possesses about the same value as the application of farm manure.

The great difference between these two processes is that crop rotation is a stimulant and ultimately reduces the fertility of the soil to such a degree that the crops fail, especially the crops that have the most stimulating effect, as clover; whereas, in application of farm manure there is a positive addition to the soil of the materials of which crops are made, so that with sufficient manure the soil may be made richer and richer for an indefinite length of time.

The only element of plant food that can be added to the soil by crop rotation is nitrogen, which can be secured from the air by clover and other legume crops.

It should be understood, however, that on many soils the marked effect produced by clover, by which increased yields of succeeding crops are secured, is not due largely or primarily to the addition of nitrogen, but rather to the power of clover to liberate mineral plant food from the soil for the use of following crops.

This process may be continued successfully until the supply of phosphorus (or of potassium in some cases) becomes so reduced that even the strong feeding clover plant cannot secure enough phosphorus for its own growth. When this condition arrives the clover crop begins to fail, and the only resource is to begin to return the exhausted plant food. Phosphorus may be returned in bone meal, in rock phosphate or in sufficient amounts of farm manure. Indeed, the most beneficial effect of farm manure is often seen when it is applied for the clover crop. This fact alone, which is a common observation, is sufficient to show that farm manure has a value not possessed by clover or by crop rotations.

We should not discourage the rotation of crops, because in almost any system rotation helps us to grow large crops, and to be successful in farming requires that large crops shall be grown even though correspondingly large amounts of plant food are removed from the soil.

It is certainly good farm practice, and usually the best farm practice, to remove the largest quantities of plant food from the soil, for the simple reason that large crops require large quantities of plant food; but it is no less important to restore to the soil, when needed, as large or larger quantities of plant food than are removed—by turning under legume catch crops and residues not removed from the field, by returning manures produced on the farm, and so by the purchase of commercial plant food, such as phosphorus in bone meal or rock phosphate, or potassium in concentrated potassium salts. Thus the most important process in all farming operations is the circulation of plant food, without which the fertility of most cropped soils cannot be permanently maintained.

Let us consider in further detail the effect of crop rotation on soil

fertility. Suppose we are practicing a four-year rotation, including corn for two years, oats with clover seeding the third year, and clover for hay and seed crops the fourth year. Let us assume such crop yields as have been produced, and as can be produced, in normal seasons on the richest, best-treated land with good seed and good farming namely, 100 bushels of corn per acre, 100 bushels of oats, and 4 tons per acre of clover including, perhaps, 3 tons in the hay crop and one ton in the seed crop. If we do not succeed in securing these yields we should at least try to make such yields possible and we should approach as near to them as we can.

Let us first consider the phosphorus required for this rotation. The two crops of corn will each require 23 pounds, 17 for the grain and 6 for the stalks; the oat crop will require at least 15 pounds of phosphorus, about 11 for the grain and 4 for the straw; and the 4-ton crop of clover will require 20 pounds of phosphorus. Thus we see that 81 pounds of the element phosphorus will be required for the rotation. If we leave the stalks on the land the requirement is reduced to 69 pounds of phosphorus or to about 17 pounds a year per acre.

Suppose the soil contains in the first seven inches 1,200 pounds of phosphorus per acre, which is about the average of the principal type of soil in the Illinois corn belt; how many years would be required to remove this amount from the land if it could be drawn upon at this rate? Only 70 years. On the other hand, suppose with this crop rotation we can secure from the soil the equivalent of only 1 per cent. of the phosphorus contained in the first seven inches. This would be only 12 pounds of phosphorus a year, which would necessarily reduce the crop yields to about one-half the amounts suggested above, and with the further reduction in the total amount of phosphorus year by year, the crop yields must be reduced accordingly.

On the ordinary soils of Illinois ultimate failure is the only future for this system of farming, even if we consider the phosphorus alone, although, as stated above, the phosphorus may be returned in bone meal, in rock phosphate or in sufficient amounts of farm manure.

If we consider the element nitrogen in this system of farming we find that 200 bushels of corn require about 200 pounds of nitrogen, aside from that required for the stalks, and the stalks must be returned to the land without burning, otherwise the 96 pounds of nitrogen required for the two crops of stalks will also be removed from the land. The oats crop will remove 90 pounds of nitrogen, making 290 pounds per acre for the corn and oats.

The 4 tons of clover will contain about 160 pounds of nitrogen and the clover roots and stubble about one-half as much as the tops, or 80 pounds per acre. If all of the nitrogen contained in the entire clover crop is taken from the air, the rotation would add only 80 pounds of nitrogen to the soil, while the corn and oats would remove 290 pounds.

How, then, is it possible to maintain the supply of nitrogen by this rotation? It is not possible. Under such rotation, with all crops removed except the corn stalks, the supply of nitrogen grows less and less. Where this rotation is successful for a time it is due to the fact that the soil nitrogen has been drawn upon year by year

while the chief effect of the clover has been to extract phosphorus from the soil for its own growth and for the use of succeeding crops.

There is another point to be considered in reference to nitrogen. On land that is capable of furnishing sufficient nitrogen for even a 50-bushel crop of corn, the clover crop will undoubtedly draw a third of its nitrogen from the soil and not more than two-thirds from the air. Consequently, since two-thirds of the nitrogen in the entire plant is removed in the tops, the roots and stubble will leave no more nitrogen in the soil than the plant takes from the soil. How, then, can we maintain the supply of nitrogen in the soil? By plowing under sufficient clover or by applying sufficient farm manure, or better, by both of these means.

If all the crops grown in rotation are fed, including the corn stalks, containing a total of 526 pounds of nitrogen from four acres, and if three-fourths of this, or 395 pounds, are returned in the manure, we have sufficient to replace the 386 pounds removed in the corn and oat crops and we may assume that the 160 pounds removed by the clover came from the air. Of course some additional nitrogen will be saved in the straw and stalks which are used directly for bedding, and not for feed.

How shall the grain farmer maintain the nitrogen in his soil? Possibly this can be done by growing an additional legume catch crop in the corn and plowing under everything produced except the grains and the clover seed, preferably only one corn crop being grown in the rotation.

The problem of maintaining the nitrogen becomes easier if we extend the rotation to include about two years of pasture, using a mixture of red clover, alsike, timothy and red top instead of seeding red clover only with the oats. In this case three grain crops, as corn, oats and wheat, or corn two years and oats one year, could be grown during the six-year rotation, the land being kept in meadow or pasture one-half the time.

It is one thing to say that farm manure has a value, but quite another thing to say what that value is or to what it is due.

The positive or intrinsic value of farm manure lies in the amounts of valuable plant food which it contains. It also possesses an important indirect value as a soil stimulant, due to its power as it ferments and decays, in contact with the soil, to liberate from the soil plant food that would not otherwise become available so quickly. There is still another distinct value in farm manure due to the fact that it makes the soil more porous and spongy and thus increases the power of the soil to absorb and retain moisture and to resist surface washing. In other words, this third value of farm manure is due to improvement in physical condition.

The value of farm manure for its physical improvement of the soil is commonly fully appreciated and frequently even overestimated by popular agricultural writers, while its value for plant food which it supplies and that which it liberates from the soil is sometimes almost ignored.

There is no good excuse for erroneous teaching regarding these different values, because there exists a vast amount of positive information both from practical experience and from exact scientific investigations.

Thus, organic matter from peat beds hauled out and spread on the land and incorporated with the soil produces no such effects on crop

yields as are produced by farm manure. Why? Because the peat does not decay readily so as to furnish plant food either by its own decomposition or by liberating it from the soil; and yet the peat has as great power as farm manure for physical improvement of the soil.

Manure made from clover hay and heavy grain rations has much greater value than manure made from wheat straw. Why? Is it because they affect the physical condition of the soil in different ways? No. The great difference in value is due to the difference in plant food and in rapidity of decay.

At the famous agricultural experiment station at Rothamsted, England, on a field to which no manure and no plant food have been applied, the average yield of wheat has been 13.1 bushels per acre for more than half a century. Land treated with a heavy annual application of farm manure has produced 35.7 bushels of wheat per acre as an average of 51 years. Another field treated with commercial plant food without organic matter has produced 37.1 bushels of wheat per acre as an average during the same time. The latter field received a little less plant food than was furnished in the manure, thus furnishing ample proof of the value of plant food supplied in manure and showing that the physical effect of the farm manure was by no means so important.

Nevertheless the physical effect should not be overlooked. Under certain seasonal conditions this physical effect may be very important. Thus in the very dry season of 1893 the land fertilized with commercial plant food produced only 21.7 bushels of wheat per acre, while the farm manure plot produced 34.2 bushels the same year.

In semi-arid regions the physical conditions of the soil and its power to absorb and retain moisture may be the controlling factor in crop yields, but where the average annual rainfall is 28.21 inches as at Rothamsted) or 37.39 inches (as in Illinois) with a fairly uniform distribution during the growing season, the physical condition of the soil in relation to crop yields may be compared to the shelter and other physical surroundings provided for live stock. In other words, under normal conditions the controlling factor is food, for crops as well as for live stock.

While manure has some value for physical improvement and a larger value of its power to liberate plant food from the soil, it should be clearly understood and always borne in mind that the great value of farm manure, especially in profitable systems of permanent agriculture, is due to the plant food it contains and that the greatest problem in the handling of farm manure is to prevent the loss of plant food.

The value of the average fresh farm manure is about \$2.25 a ton either when determined by chemical analysis on the basis of market values for the plant food contained in the manure, or when determined by the value of the increased crop yields produced when the manure is applied to the fields in ordinary crop rotations.

This means that a pile of average fresh farm manure containing 700 tons is worth \$225. If exposed to leaching from heavy rains during only two or three months in the spring the value will be reduced as a rule from \$225 to about \$150 by the loss of plant food without much reduction in total weight. Indeed, the total weight is frequently increased under such conditions, because the rain

water that remains in the manure may be in greater amount than the urine that has been washed out. Fermentation and additional leaching during the summer may easily reduce the value to \$100 or less.

There are two satisfactory methods for handling manure. One of these is to haul and spread the fresh manure daily, or at least two or three times a week. For this work a manure spreader or at least a wagon used for this work only, is very useful and almost necessary.

The other method is to allow the manure to accumulate in the stall or covered feeding shed while it is constantly tramped by the animals and kept moist by the liquid excrement, sufficient bedding being used to absorb the excess and to keep the stock clean, and then to haul and spread it on the land when conditions permit. It should not be left, however, to dry out and heat and decompose in the stalls or sheds long after the animals have been turned out to pasture.

Every system of farming should be so planned as to be both profitable and permanent, which requires that the productive capacity of the land be maintained. We must understand, then, what the soil contains, what materials are required to produce crops, in which parts of the crops these different materials are deposited, so as to know what part of the produce may be sold and what part should be retained on the farm; also what is done with these important plant food materials when the crops are fed to live stock.

The older prairie and upland timber soils of the states of the Central West are exceedingly rich in potassium, but relatively deficient in both nitrogen and phosphorus. In the worn hill lands nitrogen is usually more deficient than phosphorus, while in the average long cultivated prairie soil phosphorus is more deficient than nitrogen.

When grain crops are produced, as corn, oats and wheat, about two-thirds of the nitrogen and three-fourths of the phosphorus, but only one-fourth of the potassium required for the crop are stored in the grain or seed; while about one-third of the nitrogen, one-fourth of the phosphorus and three-fourths of the potassium are stored in the straw or stalks.

Thus a large crop of corn (100 bushels to the acre) will contain about 100 pounds of nitrogen in the grain and 48 pounds in the stalks; 17 pounds of phosphorus in the grain and 6 in the stalks; 19 pounds of potassium in the grain and 52 in the stalks. Quite similar relations exist between the grain and straw of other crops.

Now, with these facts in mind it is plain to see that a system of farming in which the grain is sold and only the stalks and straw are kept on the farm and returned to the soil carries off in the grain much of the nitrogen and phosphorus, in both of which these soils are more or less deficient, and which should be returned to the land; while the potassium, of which the soil contains an inexhaustible supply, enough in the first seven inches for 100 bushels of corn per acre every year for seventeen centuries, is largely returned in the straw and stalks.

It should be remembered that legume crops, as clover, cowpeas and soy beans, are rich in both nitrogen and phosphorus, three and one-half tons of clover hay containing as much phosphorus and 40 pounds more nitrogen than 100 bushels of corn.

If the crops are fed to live stock it is well to know about one-fourth of the nitrogen and one-fourth of the phosphorus are retained in the flesh and bone of the animal, while three-fourths of the nitrogen and phosphorus and practically all of the potassium are returned in the solid and liquid manure.

Thus we have another process of separation by which part of the needed nitrogen and phosphorus leaves the farm with the animals, while the potassium is again returned, even though it may not be needed.

It should be a plain fact that manure made from animal excrements with straw or stalks for bedding must be deficient in nitrogen and still more deficient in phosphorus, but rich in potassium, as compared with the requirements of the crop; and this is especially noteworthy when the manure is to be used on land already deficient in nitrogen and phosphorus but well supplied with potassium.

In the case of nitrogen the difficulty can be overcome by making a liberal use of clover or other legumes in the crop rotation and as catch crops, turning under these crops and crop residues so far as practicable. Legume crops may also be used in pastures to a considerable extent, thus receiving nitrogen from the air to balance the deficiency in the manure.

With the phosphorus the difficulty is greater, because the proportion contained in the manure is less and there is no such ever-present inexhaustible supply as in the case of nitrogen.

It must be apparent that to increase the value of farm manure we should add phosphorus to it. Thus we can balance manure and when added on soils rich in potassium in rotation with nitrogen-fixing legume crops we can provide plant food in a balanced ration to meet the needs of the maximum crop yields. By these means we can check the progress of soil exhaustion and even gradually increase the fertility and productive capacity of the land. Indeed, we can thus profitably enrich such land even beyond its virgin fertility.

By far the cheapest form of phosphorus is the fine-ground raw rock phosphate. This material is but slightly available for the use of crops if applied to soils deficient in decaying organic matter; but, if applied in intimate connection with rotting manure, it is thus made soluble and available for plant growth.

Certainly one of the most profitable and probably the very most profitable methods of maintaining the necessary supply of phosphorus in the soil is to put back into the manure in the form of fine-ground raw rock phosphate somewhat larger amounts of phosphorus than the animal has retained in his bones. It is well for a time, at least, to put back larger amounts than the animal retain, because the soils are already deficient in phosphorus and also because there may be some waste of manure.

These statements are based both upon the chemical analysis of soils and crops and manures and also upon carefully conducted field experiments covering many years.

The Maryland Experiment Station furnishes some valuable data from probably the earliest systematic investigations still being continued, and a large amount of information is rapidly accumulating from our more extensive work in Illinois; but the most complete experiments of long duration are reported by the Ohio Experiment Station. Where 40 pounds of fine-ground rock phosphate, costing

about 16 cents, were added to each ton of manure and 8 tons of manure per acre were applied for a three-year rotation of corn, wheat and clover, the value of the increase in crop yields was equal to \$2.66 for each ton of manure used, in case of yard manure (which was worth only \$1.64 per ton without the phosphate), and, in case of the stall manure, its value was increased from \$2.22 a ton to \$3.42 by the addition of the 16 cents' worth of rock phosphate, these results being the average of nine years' experiments on three different series of plots, based upon increased yields valued at 35 cents a bushel for corn, 70 cents for wheat and \$6 a ton for clover hay.

If we deduct the cost of the phosphate used, we still have what might be termed a net value of \$2.50 for the phosphated yard manure, and \$3.24 a ton for the phosphated stall manure.

Of course it would be equally appropriate, and possibly more so, to speak of "manured phosphate," instead of "phosphated manure," because the rock phosphate actually furnishes the needed deficient element, phosphorus, while the manure helps to make it available. On this basis we may say that the value of 40 pounds of rock phosphate is increased from 16 cents to \$1.02 by mixing it with a ton of yard manure and from 16 cents to \$1.20 by mixing it with a ton of stall manure, after deducting the value of the untreated manure in each case.

The most important fact to keep in mind, however, is that both the manure and rock phosphate are much more valuable when used together than when used separately, because manure is deficient in phosphorus and rock phosphate does not act except in connection with rotting organic matter. As a rule it is better to use sufficient rock phosphate with each ton of manure so as to supply about 200 pounds of rock phosphate per acre for each year in crop rotation (a good grade of raw rock phosphate contains at least 12½ per cent. of the actual element, phosphorus, which is equivalent to 28 per cent. of so-called "phosphoric acid").

There are two very satisfactory methods of mixing the rock phosphate with manure. One is to sprinkle the phosphate over the manure from day to day as it is being made in the stall or covered shed. The other method is to fill the spreader part full of manure, then sprinkle phosphate over it sufficient for the road, finish loading with manure and drive to the field and spread. This produces an intimate mixture and a very uniform distribution, and repairs practically no extra work to get the phosphate on the land. Care should be taken that the manure is not too dry when the phosphate is sprinkled over the load, otherwise the dry rock dust may get into the gearing or bearings of the spreader and cause them to wear rapidly.

There are some extraordinary or abnormal soils. Thus, there are soils exceedingly rich in nitrogen and well supplied with phosphorus but very deficient in potassium; as, for example, certain peaty swamp soils on which the application of potassium induces an increase in the corn crop usually amounting to more than 30 bushels per acre, and on which Illinois farmers are already using about \$20,000 worth of concentrated potassium salts annually, and with a net profit of more than 200 per cent.

There are soils exceedingly rich in phosphorus and well supplied

with potassium, but deficient only in the element of nitrogen, and which require only a liberal use of legume crops to be turned under as green manures or returned to the soil as stable manure in order to render them highly productive and profitable soils. Abnormal soils of this class exist in considerable areas in the geologic neighborhood of phosphate regions, as in certain sections of Tennessee and Southern Kentucky. Some of these soils contain twenty times as much phosphorus as the average Illinois corn belt soil.

But, when we consider the ordinary, normal upland timber and prairie soils, covering the vast areas of the Central West, the so-called "granary of the world," extending at least from Ohio to Missouri—soils of the glacial and loessial formation and of granite origin—there are two substances always to be kept in mind and always to be provided in abundance for any and every system of permanent agriculture to be practiced on these soils. These two essential substances are phosphorus and decaying organic matter, which will, of course, also supply the nitrogen.

It is not of so great consequence by what methods or in what forms these materials are supplied.

Phosphorus may be purchased in grain, or in other concentrated foodstuffs, to be fed with clover hay, it may be, and then applied in the form of farm manure, or phosphorus may be applied in the form of bone meal, which is also a farm product, or it may be obtained from the great phosphate mines of our Southern states, as we obtain coal from our extensive mineral deposits in the Northern states.

The decaying organic matter may be supplied in farm manure, or in sufficient quantities of legume crops, not harvested and removed from the land, but turned under as green manures, including the use of rotation pasturages, or still better and more easily and usually more profitably, by a combination of these methods.

But there can be no permanent agriculture for these soils by any system under which the phosphorus is removed and sold in grain and bone in larger amounts than are returned to the soil, nor under any system by which the organic matter of the soil is worn out or destroyed more rapidly than it is replaced.

On the other hand, systems of permanent agriculture for those soils are not only possible, but they are more profitable than any system under which the soil grows less productive.

The CHAIRMAN: What action shall be taken on this paper?

On motion, regularly seconded, it was received and placed on file.

The CHAIRMAN: We will now take up the discussion of the foregoing reports.

QUESTION: Professor, would you say that raw rock phosphate is profitable the first year?

PROF. HOPKINS: I could not say that.

QUESTION: Is it 2 per cent., do you think?

PROF. HOPKINS: If they use a rather heavy application, they can use it for rotting organic matter. I find the Illinois farmers use

it and then plant corn, and they say they have been getting good results from it, but I think where they used it with manure they got better results from it than where they used it without and they are now averaging \$8 to \$10 per year for every \$1.28 worth that they put on. In the last five years they have averaged, I think, about \$8 for \$1.28 supply.

MR. FENSTERMAKER: I would like to inquire of the gentleman whether the spreading of the manure in floats will help to retain the ammonia?

PROF. HOPKINS: No, sir; it will not.

MR. SCHWARZ: In your report you put nitrogen at 15 cents, phosphorus at 12 cents and potassium at 6 cents; why do you do that?

PROF. HOPKINS: Because that is what they cost. Not phosphoric acid, but phosphorus. Now, a 100-bushel crop of corn requires 23 pounds of phosphorus—of this rock phosphorus. If you will put on 100 pounds of phosphorus with every load of manure, you will get 10 pounds to the acre, that is, 2 pounds to the acre for five years, isn't it? And then, if the land does not wash away, you you will have your 100-bushel crop of corn and your land will be richer at the end of the five years than it was before.

QUESTION: You mean that it is richer at the end even if the corn crop is taken off?

PROF. HOPKINS: I do.

QUESTION: If you plant corn one year, and oats the next, and wheat the next, and then grass for the next three years, what treatment does the land need?

PROF. HOPKINS: That is a six-year rotation. In that case we put on 1,200 pounds of phosphorus, and if you had manure on twice, we divide it, and put 600 pounds to the acre each time. You will not need to put on that if the land gets rich, but if the land becomes deficient in phosphorus, we want to put on more than we take off, because we want our land to get rich. When we get the land rich then we put on just what we take off.

DEPUTY SECRETARY MARTIN: Is acid phosphorus injurious to the land?

PROF. HOPKINS: I don't think it is as injurious to the land as it is to the pocket-book. It does tend to increase the acidity of the soil, but we can put ground lime on it and lime tends to correct that acidity. I think the largest objection to it is the cost. I would like you to stop just a moment and consider these materials. We take a ton of phosphoric rock, carrying with it $12\frac{1}{2}$ per cent. of the actual element phosphorus; that is 250 pounds to the ton. That is the phosphoric element, worth 12 cents per pound, not the phosphoric acid. The phosphoric rock you can get for \$8 on cars. Now, you let a manufacturer take this, and he will put it with a ton of sulphuric acid and for \$16 he has two tons, which he will sell for

double that price. In other words, for the 250 pounds of phosphorus in the acid phosphorus you pay \$32 instead of \$8 in the raw rock, which has the element we want. Let us go a step further; he will take two tons at \$32 and mix them with a little nitrate of potash, of which we have enough for 1,700 years in the soil, and he uses that and a good deal of filler to make four tons, and he gives it a name like the "White Ox," or the "White Elephant," and puts it on the market. One sample we analyzed last year we found to contain 2 per cent. ammonia, 8 per cent. phosphoric acid, 2 per cent. potassium, 1.2-3 per cent. nitrogen and $3\frac{1}{2}$ per cent. phosphorus element. They sold it at \$20 per ton and it does not contain one-quarter as much phosphorus as you buy in the raw rock for \$8. We will carry this point a little further: you have four tons of acid phosphorus made out of one ton of complete phosphorus. Now, what do you pay for acid phosphorus?

A Member: Thirty dollars.

A Member: Twenty-five dollars.

PROF. HOPKINS: Probably an average of \$20; well, you have four tons of acid phosphorus at \$20, which contains as much phosphorus as the same amount of raw rock would at \$8.

A Member: Eight dollars and seventy-five cents here.

PROF. HOPKINS: Well, \$8.75 then. Of course you have some nitrogen and ammonia, if you want them.

QUESTION: If your land was short in potassium, and had all the phosphorus it needed, what then?

PROF. HOPKINS: Well, as I said a little while ago, the farmers are using now, annually, more than \$20,000 worth of acid salts. I would probably call it potassium chlorate, but you know it as potassium salts. You can get it cheaper in that form than in any other. We can buy it at \$45 delivered, or you can get cement at \$15.

A Member: Forty-three dollars here.

PROF. HOPKINS: Very frequently members buy cement and get as much potash as if they buy the potash they pay \$64 for. Why should you pay for the shifting and handling of four tons of material on the land when you can get it in one ton?

QUESTION: Do you think we make a mistake in mixing potassium chlorate and muriatic potash in 14 per cent. acid phosphate?

PROF. HOPKINS: That is a very good idea, but I think it comes a little high when you can get the raw rock phosphate so much cheaper.

MR. SCHWARZ: If your figures are right you should do better to get the pure bone.

PROF. HOPKINS: Well, the bone has just the same relation to phosphorus as acid phosphorus. If your land is deficient and you cannot get phosphorus, you can use bone. Bone is even preferable to acid phosphorus, but it is better still to use the rock phosphorus. You can buy three times as much rock phosphorus for the money.

MR. TAYLOR: Would it be advisable to follow up the organic matter that is in the clover and legumes?

PROF. HOPKINS: Well, yes. You can get a scant crop in clover later in the season than you can of legumes.

MR. VAN ALSTYNE: I have been very much interested in this report this afternoon, but I think you are just a little mistaken in some respects. Now, I am getting this question every day, almost, whether people shall use raw rock or whether they shall use the acid phosphorus. The soil of the average man is deficient in humus, and is in need of nitrates. Now, if we find the raw rock will not give him his money back the first year what is the average man going to do? He needs that money to live on; he must have his crops for a living, for the support of his family. I understand you to say that it is better to get the raw rock because it is cheaper, and in that way many men will be misled. I hope you will pardon me for saying this.

PROF. HOPKINS: I did say that, and if I have misled anyone I am very sorry, because it is not my intention. But I have asked half the farmers in Illinois what has been their experience, and they all tell me, "Tell them to use the raw rock; we have used both, and our experience has been in favor of the raw rock."

MR. WING: I have a carload of the raw rock; can I safely sprinkle that carefully on and then put the manure on it?

PROF. HOPKINS: The rock should be a uniform mixture with the manure when it is put into the ground. Let me illustrate: Suppose you take a pitchfork with a bright steel tine and put it into the manure and leave it there for six months. You know what would happen to it. If there are any tines left you can easily break them with your fingers. That is what you call the organic matter in contact with the raw phosphorus.

A Member: Before we get away from that point, will it be profitable to put floats on, turn it under, because I have enough organic matter in my soil to make the required mixture?

PROF. HOPKINS: Well, it might be profitable, but it would be more profitable to put on about eight loads of manure and sprinkle every load.

A Member: The last cement I had was \$6 at the mines.

PROF. HOPKINS: Well I suppose that is true; it costs about \$4.50, I suppose, in bulk, and about \$5 in bags, and it may possibly be more.

The SECRETARY: The Professor has a written question and while he is glancing at it I will make an announcement. There is a lot of corn out there without any marks on it; this exhibit is in charge of Mr. Bayard, editor of the National Stockman and Farmer, and the members to whom the corn belongs will please see him about it, so as to enable him to identify it.

PROF. HOPKINS: I have been handed a letter which I will read; the names have been taken off, so I can give you only the body of the letter. It reads as follows:

"Dear Sir: Your favor of the 24th inst. received and noted. We quote you High Grade Fine Ground Tennessee Phosphate Rock (not acidulated) at \$12.00 per 2,000 lbs. f. o. b. cars Baltimore, net cash.

"We have seen the article written for one of the Farmers' Journals, advising the use of Ground Phosphate Rock, and we feel sure that the writer of the article is in error. Ground Phosphate Rock, whether it be Tennessee Rock, Florida Rock, or South Carolina Rock, is not available unless it is dissolved, and the farmer may just as well use so much sand or dirt.

If Phosphate Rock were available by simply grinding it fine, we certainly would not dissolve it, as we would sooner ship the Fine Ground Rock than the Dissolved Rock, for very many good reasons.

"For the stables and manure heap, we would recommend Genuine Nova Scotia Land Plaster, or Dissolved Phosphate Rock. This same thing occurs every little while, and we are free to say that we have never supplied the same man twice with Ground Phosphate Rock; we would therefore advise those who insist upon making the experiment to go at it lightly, until they have fully demonstrated the value of Ground Phosphate Rock.

"Awaiting your valued favors, we remain,

"Very truly yours,"

PROF. HOPKINS: That letter demonstrates the manufacturer's side of the question. He has something that he is anxious to sell. Now, at the Ohio Experiment Station they have put the raw rock on the land in a part of the field for five years, and manure, and I may say that they have also their the acid phosphorus and the genuine land plaster, and cement, and the phosphorus paid them the best returns. The phosphorus has paid them \$6.97 for every dollar invested for the past nine years, with corn at 35 cents and wheat at 67 cents. The acid has paid them \$4.59 in the same way; the land plaster has paid its cost, and more; but in the end of the one that has paid the largest return for the amount of money invested is the fine ground rock. I have looked over the situation at the Ohio station and I have confidence in their work. I think there is no work more thoroughly conducted than theirs is.

EX-SECRETARY EDGE: I want to ask you regarding the experiments conducted by Mr. Thorne. Have you confidence in them?

PROF. HOPKINS: Absolutely. I think there are no safer experiments in the world than those conducted by Mr. Thorne.

The SECRETARY: Mr. Edge, I am sure, does not mean any reflection on Mr. Thorne's work; he is simply asking for information.

DR. HUNT: I also want to know about the experiments of Mr. Thomas, and agree with Mr. Hopkins. I would like to say just a word in this discussion. Prof. Hopkins will not misunderstand me, I am sure. I want to refer to the statement he made that the soil has potassium enough, and it is not necessary to put it on. Now, what is the condition in the eastern part of the United States? Now, I was born in Illinois and know the land that Dr. Hopkins experiments on as well as I know my own children. I know Ohio fairly well; I have spent four years there and have made experiments there. I have also experimented in New York and know a little of Pennsylvania.

Now, you may say that one-seventh of the hay raised in the United States is raised in New York, on the Dunkirk clay loam, and

there we obtained the best results with nitrogen. When we put on 160 pounds of nitrogen and 320 pounds of phosphorus we got the best results—better than when we put on 160 pounds of nitrogen and 640 pounds of acid phosphorus. When we put on the phosphorus alone we got no results. When we put on the nitrogen alone we got good results, but when we put them on both together we got better results.

Now, this is nothing against what Dr. Hopkins says, and what he says is gospel truth. He lives in Illinois and in different climates you get different results. I merely mention this as a matter of caution. I have come to the personal conclusion, and I think that three years of work have demonstrated to me, that in the eastern part of the United States the importance of nitrogen is greater than that of phosphorus. It is only an opinion based on three or four years' work and does not deserve to be compared with the excellent work at Wooster, Ohio, for the past nine years, and also with the excellent work done at the University of Illinois.

PROF. HOPKINS: I think I will modify my statement that the hill lands are most deficient in nitrogen, and the other lands in phosphorus.

MR. WING: What is the original condition of the phosphorus? Is it in a similar condition to the floats?

PROF. HOPKINS: No, sir; it is in the condition of ground rock; originally it was all in that condition, but some of it has been taken up by growing crops and has stored the organic matter, and a little of it now is in the organic matter, but the larger part of it is still in the ground rock.

MR. RODGERS: Is there any way by which the average farmer can tell when it is in the soil?

PROF. HOPKINS: I think the average farmer can do something in the way of experiments by way of peat or seed, but I think the work should be done by the experiment station at the expense of the state. Illinois is now doing it, and the cost is a mere bagatelle compared with the importance of the work. They expect to complete the work of mapping the state in this manner is about twelve years. If the same thing were undertaken in Pennsylvania it would not be much more of an expense than the cost of your space at the St. Louis Exposition, and, by the way, how much did you just pay for your new Capitol?

QUESTION: How about calculating the condition of the land by rotation? Can we do that?

PROF. HOPKINS: That has been dispensed with, because a good many people who wrote about that knew nothing about it. For instance, they tell us we have one-tenth as much potassium there as we need, and we find we have as much nitrogen as would be required for five rotations, and then we take another soil and we find as much potassium there in the first seven inches of soil as 100-bushel crops of corn will take out in 1,700 years.

QUESTION: How much of it is applicable now?

PROF. HOPKINS: There is none of it applicable now; I don't believe there is enough potassium or nitrogen on any farm, today applicable, to make a crop of corn. It is gradually liberated during the season.

QUESTION: What about basic slag?

PROF. HOPKINS: As you draw slag from steel works, it is certainly very valuable, but I would not place any more value upon it than upon any other form of phosphorus. The bone materials I count of as much value. The only difference is that the slag carries with it some lime. Now, lime is cheaper than phosphorus, and when you can get pure ground calcium carbonate so cheap, you don't put much value in what is carried in slag. But if you can get the phosphorus in slag as cheap as you can in acid phosphorus I would take the slag for the lime.

QUESTION: What is the action of slag?

PROF. HOPKINS: Well, I suppose in a high grade of slag, the phosphoric acid would be about 7 per cent.; phosphorus about the same, possibly from 16 to 18 per cent. of acid phosphorus. It is about as rapidly applicable as the bone, and acid phosphorus. It is not quite as soluble.

MR. WING: Now, I rather agree with the Professor when he says that when the phosphorus is taken out of the soil the crops will not grow, but when it is put back, it produces more than 100 bushels per acre. I am glad to note that he sets the standard at 100 bushels. What did you average, Professor?

PROF. HOPKINS: About 88 bushels on the average, 70 pounds to the bushel.

The CHAIRMAN: Are there any further questions on this point?

The SECRETARY: Now, Mr. Chairman, I take a great deal of credit in asking Prof. Hopkins to come all the way from Illinois. He manifested a willingness to come, if it was possible that he could be of any service to us here. Now, I think he manifested such a courtesy in coming to us to talk so interestingly and instructively that it is worthy of a vote of thanks, and I move that we tender him a rising vote of thanks.

Duly seconded and agreed to, a rising vote of thanks was tendered to Prof. Hopkins.

On motion, seconded and agreed to, adjourned until 7:30 P. M.

Wednesday Evening, January 23, 1907.

The meeting came to order with Mr. McClellan in the Chair.

The CHAIRMAN: The first number on the program is the report of the Committee on the Identification of Fruit. Is Dr. Funk ready to report?

REPORT OF COMMITTEE ON IDENTIFICATION OF FRUIT.

DR. FUNK: I will have to ask the indulgence of the house. I really forgot I was on the program for this evening until after the meeting this afternoon, when it was too late to do more than look cursorily at the display. I find here,

One plate of pears for identification.

Two plates of Northern Spy and two plates of Rhode Island Greening exhibited by R. J. Weld.

One plate Bullock Pippin, two plates Jonathan and one plate Memphis Pippin exhibited by A. I. Weidner.

One plate late winter pears exhibited by Mr. Snaveley, the "Glon Marceau."

A display of fruit by Mr. Naginey, among them an apple for identification.

Several plates of apples without names attached.

In regard to all this fruit I want to say it shows a negligence in spraying. It needs a fungicide, like Bordeaux mixture. There is not much codling moth, but there is some evidence of it, and I think the owners will do well to take every precaution and see that the fruit is properly sprayed.

MR. SCHWARZ: What did you say was the name of that winter pear?

DR. FUNK: The Glon Marceau. A little of it will go a very great way. The best thing to do with it is to feed it to the pigs.

The CHAIRMAN: What shall be done with this report?

On motion, duly seconded, it was agreed to receive it and place it on file.

The CHAIRMAN: Next is the report of the Committee on Identification of Vegetables. Is there any report to make?

MR. HERR: We have no report to make, because there is no display of vegetables.

The CHAIRMAN: We will then proceed with the next number, the report of the Committee on Legislation.

MR. KAHLER: I will have one of the committee read that report in a few minutes. My sight is so bad that I will not undertake to do it myself as chairman of the committee.

The CHAIRMAN: Until this committee is ready to report we will take up the next number on the program, which will be the report of the Mineralogist, Col. Demming. I see he is here now.

Col. Demming then read the Mineralogist's report as follows:

REPORT OF MINERALOGIST.

 BY COL. H. C. DEMMING, *Harrisburg, Pa.*

The correspondence on mineralogy alone during the year 1906 exceeded one thousand letters. Inquiries came from many other states and countries. The following is a sample from Iowa:

"Can you refer me to localities in Pennsylvania where large deposits of quartz sand or a good grade of building sand can be found? It is my desire to locate such a deposit for the purpose of establishing an industry for the manufacture of sand lime brick. The sand for this purpose should be high in the percentage of silica, and should be sharp and free from loam." He was informed of more than fifty localities. He has also written that he wants 1,000,000 cubic yards of sand with which to start operations.

Another gentleman came to Harrisburg from New York City in search of 18,000 tons of first-class building sand. He also was referred to numerous localities.

In the same line was an inquiry from a corporation manufacturing window glass. Judging by the tone of the correspondence they consume a trainload of glass sand every working day at their seventeen different plants.

During the year numerous other inquiries were made for silicates similar to the aforementioned, and all the inquiries answered satisfactorily except in one instance, that for a large deposit of loess. Loess is mentioned in but few standard authorities on mineralogy or geology, and any information respecting it is very unusual. It is a fine earthy deposit, mostly silica, following the courses of valleys or streams, like alluvium, but without division into thin layers. One of its constituents is invariably a calcareous material, generally in concretions. It is most frequently found in elevated terraces along the broad parts of large valleys, as on some parts of the Delaware and Susquehanna rivers; but the fine particles of coal which are carried down our largest streams, lodging with or on the loess, have destroyed these deposits for commercial use, viz: the manufacture of cement or similar products. Portland cement, which has now become essential in the making of concrete or artificial stone, originated in England by the mixing of 70 per cent. of chalk with 30 per cent. of the alluvial clay or mud within the lower tidal basins of the Thames and the Medway, the mud supplying the silica and alumina in proper condition, and the chalk the calcium carbonate or lime. In this connection there has been serious talk of forming a cement trust. It is doubtful whether such a combination can long exist in Pennsylvania, as in nearly every county of this Commonwealth can be found all the necessary constituents of the best hydraulic and Portland cements.

Inquiry is made for deposits of asbestos. The locations of the mineral have been mentioned in former reports. There is an in-

creased consumption on account of its uses as an insulator in electric wiring.

The demand for barite (sulphate of barytes) is increasing and belief now is that there is a large body of this mineral near Bridgeport, Bedford county. Heretofore most of it was mined in Berks, Blair, Clearfield, Franklin, Fulton and Huntingdon counties, though in none of the counties as extensively as is southern Virginia. It is worked up (sparingly) into barium salts and as an ingredient in paints. When used too freely in the latter it becomes an adulterant.

The extraction of bromine from the brine of abandoned gas and oil wells is receiving attention from a number of capitalists, and the product will be materially increased in Pennsylvania this year.

Clays of various qualities are more freely and eagerly sought for than heretofore. Sometimes for days that will be the subject in our mails. It seems that every county has a large supply of one kind or another. So important has the clay industry become that a number of the states have issued separate reports on the subject. The State of New York has published a volume of over 900 pages on clays found within her borders. It would well repay the Commonwealth of Pennsylvania to follow suit, as we have larger bodies and in some instances of finer quality than any of our sister states. Men of capital go elsewhere than to Pennsylvania for clays because other communities are more liberal in their publications given all the information possible on the subject. Much foreign capital skips over Pennsylvania for investment elsewhere, first, because we have no State museum of our natural resources, secondly, because our economical geological and mineralogical literature has been so scant, from lack of appropriation; and thirdly, because every state surrounding ours has a salaried State Geologist who is liberally paid to gather up all useful data and publish them in separate annual reports, whereby capital is attracted to their territory, large industries established, and communities made rich and prosperous. It is rather mortifying to receive voluminous annual geological and mineralogical reports from other states—New York, New Jersey, Maryland, Ohio, West Virginia, etc.—and not to be able to send any in exchange. If it were not that our resources of coal, petroleum and natural gas are in such excess, compared with most of our neighbors, we would be falling rapidly behind in population and prosperity, because we are not advertising our natural wealth like most of our sister Commonwealths.

During the past year coal mining has been carried on more extensively than heretofore and our output would have been much heavier if the transportation companies had supplied the cars. I examined a number of large bituminous coal mines where the men could work but little more than half time because of scarcity of cars to haul the product away to market. This is true notably in Allegheny, Greene and Washington counties, where I spent nearly a week under ground. Some time was also spent investigating or locating coal lands in West Virginia, a state of marvelous natural resources both of coal, gas, petroleum and timber. The coal beds of Western Pennsylvania extend through our neighbor on the southwest, and clear on to Alabama, the total area underlaid with good, merchantable coal, being more than 80,000 square miles, or nearly twice as

large as all of Pennsylvania. The Pittsburg bed within our borders is 2,015 miles in extent, with, in many places, from three to six other good coal beds either above or below it. Whoever says there is to be a natural coal famine in this century or the next has either not reckoned at all or gone wild in his calculations.

The increase in the price of copper from 12 to 25 cents per pound, and the price rising, has stimulated the mining of copper ores wherever found. The output of copper in Pennsylvania this year will probably outstrip any previous twelve months. It may be of interest to state that the Cornwall ore banks in Lebanon county have also produced all told over \$700,000 worth of metallic copper.

Corundum and emery are now mined successfully in Berks, Chester and Lehigh counties.

The fluorite deposit of northern Fulton county remains undeveloped, while manufacturers of hydrofluoric acid at Easton and Philadelphia are obtaining their supplies of the crude mineral from Southern Illinois.

Gold bearing ores have been found in 29 counties of the State, but in no instance has the gold been extracted at a profit sufficient to warrant extensive mining. The largest known gold placer deposit lies under the most populous part of Philadelphia. Where excavations have been made for cellars along Market street from Third to Broad, free gold could have been extracted from nearly every cubic foot of earth or gravel taken from a depth of 12 to 20 feet. This has been demonstrated a number of times by the use of a miner's pan. Some of the material from a large cellar recently dug at the southwestern corner of Thirteenth and Market streets would have been found to yield at the rate of 25 cents per cubic yard, or nearly 100 per cent. richer than the best paying larger placer in California. This gold that underlies Philadelphia has apparently been carried there from some point on the Schuylkill or Delaware river. The source has never been discovered.

The graphite industry of the State is making good headway, the product coming principally from Berks, Chester and Delaware counties.

Ganister rock (another silicate) is shipped in immense quantities from Blair, Huntingdon and Mifflin counties for furnace purposes, there being a good market also in other states. From some of it quantities of silica brick are made near the source of supply. There are large bodies of this rock in northeastern Fulton county.

Iron ores are attracting more attention than for years. New processes of iron manufacture permit the use of Pennsylvania ores and these, combined with the gradual rise of crude ores from the great northwest, have led to the revival of an old industry, which will be more and more marked from this time forth.

The large deposit of melanterite (native copperas) near Olivet, Armstrong county, remains undeveloped.

Manganese ores have been found near the northern boundary of Indiana county; but little has been done there in exploitation of the extent of the deposit. In the meantime similar ores are brought into Pennsylvania from as remote points as Asia Minor.

Magnesian ores of fair quality have recently been found in the southwestern corner of Bucks county.

There is a strong probability of a resumption of nickel and cobalt mining in Lancaster county, where good copper ore has also been found.

Natural gas has been struck in greater volume than heretofore. Two wells—one near Kane—have thrown out, it is roughly estimated, as high as 200,000,000 cubic feet of gas in 24 hours and the roar of one of the wells could be heard eight miles away. This has given a remarkable impetus to the natural gas output of our State. I hope the present Legislature will make an appropriation whereby there can be obtained the amount of natural gas and petroleum we are producing annually; also that there can be published a revised colored geological map of the Commonwealth giving the gas and petroleum territory, and, if possible, the location of every well, its depth and output to a specified time. This would be a great aid to intending investors in the State and would also afford a basis for taxation of products which now escape all Commonwealth assessment, where other states derive a good revenue. The fact is that we are being depleted of this wealth, without return, save in the increase of local prosperity, and a population which will go elsewhere as soon as these treasures are gone.

From day to day there is more foreign inquiry for peat and peat deposits, but thus far the most practical work has been done in Columbia county, where a company is digging it out as a constituent for some article manufactured there. Peat has now been found in a number of counties, from Pike on the east to Erie and Lawrence counties on the west.

Phosphorus ores are mined in considerable quantities within 30 miles of Harrisburg, and one of the minerals, wavellite, traced along the South Mountains to the western bank of the Susquehanna river.

Radium bearing minerals have thus far been found in Adams, Schuylkill and York counties, but nothing has been done in a practical commercial way.

Some inquiry has been made relative to the revival of salt manufacturing in Pennsylvania, but little has been done in the matter, though the brines from the deep wells of Fayette, Indiana and Westmoreland counties, can be made to yield the best table salt in the land.

The quarrying of slate in great quantities is still carried on in Lehigh and York counties, with a strong probability of the field extending to Berks, Lebanon, Dauphin, Cumberland and Franklin counties.

Ores containing tantalum and titanium are being sought for in Pennsylvania for use in Europe, the most urgent demand coming from Germany. Titanium crystals, as made in the electrical furnace, are harder than diamonds, and when used in circular saws will cut stone or metals as easily as a common circular saw cuts wood.

Tungsten ores are also wanted. Tungsten greatly improves steel products.

There has been a marked revival in zinc ore mining and several mines in eastern counties, abandoned a few years ago, are again in operation.

Zirconium has been found in some of the iron ores of central Pennsylvania, but thus far in too small percentages for special extraction.

One very commendable feature in connection with our new State

Capitol is the establishment of a State Museum in the old executive building. Thus far few if any minerals have been obtained, but a fair exhibit of mineralogy of Pennsylvania will soon be assured. Then we will have a place where our natural products can be studied with decided profit to all comers. In the building up of the division of mineralogy it has been urged by your Mineralogist that at least three samples of each mineral be secured, the first as an average of the outcropping, if there is any outcrop, then an average sample of the mineral as mined, then an ideal specimen. Thus one will have a guide to the finding, in undeveloped sections, of every mineral that can be reasonably looked for in any part of the State. Here is where our colleges and universities have lacked, as students have usually been shown extraordinary samples, which are seldom, if ever, found in practical out-of-door work.

As more earnest and intelligent attention is being given to mineralogy every year, we believe that Pennsylvania will ere long take a front rank and every section of the Commonwealth be correspondingly benefited.

The CHAIRMAN: What action shall be taken on this report?

On motion this report was received and filed.

The CHAIRMAN: We will next take up the reports of the Geologist, in order to give Col. Demming a little rest, we will listen to Mr. Stout first.

Mr. Stout then read the following report on Geology:

GEOLOGY AS RELATED TO AGRICULTURE.

BY MR. W. H. STOUT, *Pinegrove, Geologist.*

The tertiary period, the latest deposit, during which animals and plants developed, and by their death and decay added their remains to the disintegrated rock, now forms that portion of the earth's surface devoted to use in agriculture.

A large part of Pennsylvania soils consists of stratified rock, deposited by water action, forming the shales, sandstone, clays and limestone, largely derived from the older formations, the granite and traps, the material now supposed to form the interior of the earth in a molten condition.

Extinct and active volcanoes found on many parts of the earth have no doubt produced the existing topography of valley and mountain, together with the water from rain ever carrying into the oceans the disintegrated particles liberated through frost and heat, forming new deposits in coast regions and river deltas, at the same time reducing the elevation of continents.

As a result of the various rock stratas through which water courses flow, the river bottoms and deltas are of the most productive soils, usually containing the elements of plant requirements, in combination with the particles of minerals, sand, clay and substances of animal and vegetable origin.

There are in this State so many varieties of soil, varying in physical and chemical constituents besides elevations, changing the climatic conditions, that to bring them under review would be a task too large for any one to undertake and present in an intelligent manner in a brief article. Taking the several limestone foundations, the sandstone quite various, the shales of various ages, and the clays derived from these, together with those soils derived from granite and glacial action, each differing from the rest, are of interest to agriculture and is receiving more attention than heretofore. It is to be regretted that there exists such a confusing nomenclature in geological literature, to which more is being added by recent writers and investigators.

Considered solely as a medium upon which to grow crops, soils of the same physical characteristics may or may not be productive in proportion to the available elements they contain. However rich in fertility a soil may be originally, constant cropping without restoring the elements abstracted will in time be exhausted and only equal to a soil naturally poor and unproductive.

The theory of almost inexhaustible mineral elements in our agricultural soils may be true to the chemist; it is not true in practical farming, the latent elements not being available to plants; if they were it would be folly to seek mineral elements from various sections of the world to replace what is removed with crops.

The CHAIRMAN: What action shall be taken on this paper?

It was moved and seconded that it be received and placed on file.

MR. KAHLER: The Legislative Committee is now ready to report. Mr. Herr will read the report, if there is no objection.

The CHAIRMAN: We are now ready to listen to the report of the Legislative Committee.

REPORT OF THE LEGISLATIVE COMMITTEE.

Mr. Chairman and Members of the State Board of Agriculture:

Your Committee on Legislation submits for your consideration the following report:

The recommendations embodied in the report of your committee and adopted by this Board one year ago, asking for some needed legislation to protect the interests of the farmers of the State and all others interested in agriculture, have only in part been referred to the proper Legislative committees, and some of them are now being considered by them. None have as yet been enacted into laws, for no legislative sessions have been held since our last meeting that could take proper action, and you will now find that a part of the recommendations of last year are embodied in the report.

And we again recommend an amendment to the township road law, wherein it provides that the State pay 15 per cent. when the township votes to pay their road tax in cash, and ask that it may, be made 50 per cent. instead. We also further recommend that the

words "county" and "township" be eliminated as to the application for new roads from the State highway law, and the State Highway Commissioner to have entire jurisdiction under the bill to proceed without the consent of the county commissioners or township supervisors, which, in our judgment, only complicates and hinders the working of the bill and delays the work of the Commissioner, and it would also relieve local taxation to some extent and place the additional tax on the State, where it justly belongs, and in order to relieve the excessive tax burden on real estate, we favor a two-mill tax on all corporate and personal property in the State, to be levied and collected annually, and expended only for public roads, and distributed to the several counties according to the road mileage in each county, to be used annually, one-half by the State Highway Department and one-half by the townships, for the reconstruction and maintenance of permanent public roads. We recommend the amendment of the road law so as to authorize the planting of trees along the roads constructed by the State. Also recommend an appropriation of at least six millions for two years from June 1, 1907, in addition to the sum now available, in order that the reconstruction and building of roads may not be delayed but pushed rapidly forward by the Highway Department.

We also recommend an increased appropriation to the public school fund and that an appropriation for the State Normal Schools be made a separate fund.

Resolved, That we recommend all of the appropriations asked for by the trustees and authorities of the State College be granted, that our State Agricultural College may no longer stand in the rear rank of agricultural colleges of our sister states.

We also favor an increased appropriation for the township high schools, which will encourage townships to establish such schools.

We recommend such legislation as will enable the Dairy and Food Division to fully enforce the provisions of law already made and we favor the enactment of law that will protect the manufacturer and consumers of all food products against adulteration by fraud.

This committee respectfully recommends a law creating the Department of Agriculture be so amended as to create a Division of Horticulture, at the head of which shall be a practical Horticulturist.

We also recommend that such laws be enacted by the present Legislature that the great water powers under control of the State should be so protected that when franchises are granted in the future, such franchises should bring a revenue for the State, and be limited in time.

We also recommend that the present Legislature enact a law giving trolley companies the right to carry freight and also giving them the right of limited eminent domain, and as we do so, deny them the use of our public roads, as it endangers travel and greatly interferes with the improvement of our public highways.

While it is recognized that agriculture is the seat of prosperity, of our country, we do recommend that the legislature make a larger appropriation towards carrying on farmers' institute work. We would, therefore, recommend that \$50,000 should be appropriated instead of \$35,000.

We favor the abolition of the "work tax" system, believing all road

taxes should be paid in cash, provided that the State pay 50 per cent. of the amount raised.

We favor the passage of a law which will require, after some reasonably distant date, the use of wide tires for all hauls over 1,800 pounds. (Signed)

A. J. KAHLER,
JASON SEXTON,
J. N. GLOVER,
S. S. BLYHOLDER,
MATTHEW RODGERS,
Committee on Legislation.

Also the following report from the Committee on Drafting a Bill Regarding Live Stock:

In view of the fact that thousands of dollars' worth of honey is annually imported into the State, while, owing to the fact that brood diseases have so reduced the number of colonies of bees that there are not enough left to properly pollenize the flowers, while thousands of dollars' worth of honey remains ungathered, therefore

Resolved, that we ask the Legislature to pass such laws as will eradicate the diseases that have done so much damage to this industry in the State. (Signed)

GEO. G. HUTCHISON,
DR. E. E. TOWER,
E. E. CHUBBUCK.
J. W. NELSON,
J. H. FUNK, M. D.

The CHAIRMAN: Gentlemen, what is your pleasure in regard to this report?

On motion, regularly seconded, it was agreed to adopt it as read.

The CHAIRMAN: We are now ready to listen to Col. Demming's report on Geology.

This report is as follows:

REPORT OF CONSULTING GEOLOGIST.

BY COL. HENRY C. DEMMING, *Harrisburg, Pa.*

One year ago we mentioned the great increase in value of a farm that had been investigated geologically, and the owner made wealthy by the discovery and development of a quartzite of extraordinary purity. The rock deposit has been worked throughout the year and many tons sent to market at good prices. The operation is to be increased until the output shall exceed 50 carloads a day.

Within 50 miles of that place another farm owner has opened a large deposit of granitic rock, a quantity of which has been used as the exterior material of some of the most beautiful and costly residences and churches in Berks and Lehigh counties. It is to be regretted that this granitic quarry was not fully opened when the Com-

missioners were looking for stone for our new State Capitol. Until recently the United States authorities at Washington were stating that no granite had been found in this Commonwealth, and that consequently we were obliged to purchase anything of that character from owners of granite quarries in other states. This day will soon be past, for we have hills and small mountains containing as good granite as has been found anywhere in this country.

In some of the mountain ranges of Pennsylvania there are immense bodies of rock composed almost entirely of iron ore and silica. By a little skillful manipulation an industry could be built up in nearly half of our thinly settled counties in the preparation for market of what is known as ferro-silicon. Where the iron contains 10 per cent. silicon the present market price is \$30 per ton; 20 per cent. silicon, \$40 per ton, and 50 per cent. silicon, \$106 per 2,000 pounds. Many have expressed themselves as wondering why these numerous mountains of our State were made; but as the years pass by something is found, partly hidden away, toward solving the inquiry.

Geology includes in its scope the natural waters of the earth. How little we value them, and how little we apply them to the uses of man outside of the old-fashioned ways. Let me call attention to another use of our streams, and in order to do this we will take the facts as given in the *Youth's Companion*, of Boston, as well as from the *Technical World Magazine*:

"One of the most interesting farms in America is to be found in Oneida county, New York, close by the historic battlefield of Oriskany. It is the farm of Mr. E. B. Miner, and is attracting attention because of the way in which much of the work on it is being done by Oriskany creek. One by one the old crank handles, familiar emblems of drudgery to every country boy, have been thrown away, until today churn, separator and grindstone whirl merrily without the labor of a hand upon them. Little more than a year ago one of the sons of David M. Miner, who then owned the farm, persuaded his father to begin harnessing the little creek which plunged merrily down through their farm to its junction with the Mohawk.

"In October, 1905, a dam was begun, having concrete wings and foundation and leading to a concrete wheel pit. A head of four and a half feet was obtained with a constant flow of 4,000 gallons a minute.

"A thirty-inch upright water-wheel was installed, which developed seventeen and a half horse power, and to this was attached a twelve-and-a-half-kilowatt generator. Fifteen hundred feet of bare aluminum cable led the current to the house, where twenty-five sixteen-candle-power lamps were installed; and to the barn, where eight more were placed.

"Two months after the dam was begun the water was sent through the wheel and the lights turned on. Since then the power plant has run continuously night and day, with no attention except supervision and oiling two or three times a week.

"Fuel in the Mohawk Valley in mid-winter is expensive both in money and in the labor required for maintaining fires. Mr. Miner's son installed a 4,000-watt heater, which heats two rooms—about 2,400 cubic feet—to a temperature of seventy-five degrees when it is zero outside. That put the old coal stove out of business.

"In the creamery, where the milk from twenty-five cows is manufactured into butter, there is a separator which must be turned 7,400 revolutions a minute morning and evening till the milk of the whole herd has gone through it. A small motor—half horse-power—was mounted so as to be convenient, to this and connected to it by a belt. It did the work to perfection, and the first crank-handle was thrown away.

"To make the action more complete, a bucket of water was tripped over the separator, and a float arranged to break the circuit when the last of the milk ran out. Now, when the separator process ends, the motor is automatically shut off, the water dumped in, the motor started again for a moment, and the separator rinsed and emptied, all without a hand being put to it.

"The churn, a big barrel affair, was mounted on a swivel platform, and brought into line with the same motor; and then a grindstone, the terror of the farm, was added.

"The hand-pump which furnished water to the house tank in the attic was discarded, and the little motor took over that task. Wood was still burned in the kitchen. A larger motor was acquired, coupled to a saw, and the job of sawing wood was lightened of its labor.

"Electrical flat-irons were provided for the kitchen; electric fans, a motor-driven freezer and an electric cooker will be added for the summer comfort.

"Only a small part of the power of the creek is used as yet, but plans are under way for increasing, to the accomplishment of other farm tasks, the ready service of the little creek which for so many years ran idly by the farm, waiting to be harnessed."

What I said six years ago, in an address to the citizens of Franklin county, Pennsylvania, I believe will apply, to a more or less extent, to nearly all the counties of this Commonwealth:

"I have found by careful observation and examination that your streams are capable of generating enough electrical power to not only run every train of the Cumberland Valley and Western Maryland, but fifty times the machinery now employed from mountain range to mountain range, and from the Potomac to the Susquehanna, with enough over to illuminate not only every street of every town, but every country road and by-lane. And then enough left to light up every building almost as brightly as daylight, besides furnishing motive power for every barn and house, and heat for every room of home. Yea, more; and a surplus for other counties. And all this not utilized because Aladdin's lamp though hanging low, is not rubbed until the good genii appear, and ask what will you have us do? In other words, the good people of your county are so contented and happy with their peaceful lot compared with others of their fellows, that the nubbins fruit is good enough, though golden pippins hang just beyond.

"The New Franklin County.

"Permit me one concluding picture of Franklin county in the ideal future—not the next century, but this. Every farm and home beautified by Nature study; every business place a model patterned from Scotch, Irish, German and American originality; every dwelling

place a place of health, contentment and prosperity; houses not built of frame or brown red brick, but of pure white Romanesque blocks made from the kaolin beds along the Blue Mountains as well as those of the South Mountain; sidewalks of white chalcedony, quarried from the archæan hills; curb stones of greenish white poëtsdam sand stones of Mont Alto; paved streets and country roads from cream-colored vitrified brick manufactured near Richmond furnace, and north and south of Shippensburg; public buildings and churches of the pink tint and grayish white stone northwest of Mercersburg; employment in innumerable establishments resulting from development of sands, and clays, and earths, and rocks, and other minerals, only a few of which have been indicated; young ladies and young men also employed, the former in etching and engraving Bohemian glasses, and polishing and fitting lenses, and doing other skilled work which only the deft and gentle fingers can do; and the latter in rolling plate glasses, etching and hand cutting flint glass, and kindred work, all from the material from your own delectable hills and mountains. Middle aged men managing or watching the automatic machinery of mills and factories run by electrical power generated from your own streams, and the middle-aged women superintending the homes where electricity does the cradle rocking, the churning, the washing, the sewing machine running, aye, the heating and cooking, as well as the lighting, and household drudgery is known no more, for the Conedogwinet, the Little Antietam, the Conococheague, and Back creek and Cove creek, by turning of turbine wheels are all merrily helping to make home happy, and Franklin county one of the most desirable spots for mankind on earth.

“Electric Fountains and Liquid Air.

“Then for outdoor adornment, amusement and recreation the electric fountain in the yard, and in every public square of every town and hamlet; family motors propelled by electricity, or compressed or liquified air of best home-made brand; a series of fairy-like lakes where are now rumbling streams; the shores flower-embroidered by day, brilliantly illuminated with many colored lights at night, and electric launches flitting here and there, with merriment, music and innocent laughter; hill and mountain sides dazzlingly bright with arc, incandescent and helium lights; valleys in early evening shining with brightness and social cheer; passenger or freight trains moving even more rapidly and safely than now, with no noise, no flying cinder, no smoke, for all such motive power is either electric or by liquid or compressed air, or denatured alcohol; rents lower, in exceptional cases of new comers—all others owning their own homes—because taxes and all living expenses are less, and wages are higher than ever before. And through every phase of human life in Franklin county, because her people have taken advantage of what Nature has given them, and with the change for the better, most of the sorrows and sighings have forever flown away.”

The CHAIRMAN: What action shall be taken on this report?

On motion, duly seconded, it was agreed to receive the same and file it for publication with the rest of the proceedings.

MR. McHENRY: I would like to offer the following resolution:

"BE IT RESOLVED, That we, the members of the State Board of Agriculture of Pennsylvania, in annual session assembled, do hereby express our appreciation and thanks to the Hon. N. B. Critchfield, Secretary of Agriculture, and to the Hon. A. L. Martin, Deputy Secretary, and Director of Farmers' Institutes, for the able and excellent program prepared for this meeting and wisdom shown by the arranging for this joint meeting of the several organizations here assembled; and that we hereby express our sincere thanks for their untiring efforts in the furtherance of the agricultural interests of this great Commonwealth.

"Hoping that we may be able to share with them the benefits and pleasures of many more such meetings as their assistants and co-workers, this resolution is respectfully submitted."

MR. HERR. I move that we pass that by unanimous vote.

Seconded and agreed to, and resolution passed by unanimous vote of the members present.

MR. HERR: Before we proceed further with the program, I have here the resignation of Col. Demming as Consulting Mineralogist. What shall be done with it?

Hearing no objection, the same will be accepted, and recorded with the minutes of the Board.

The following address by Mr. Van Alstyne, was read at the joint meeting, held on Wednesday evening, and while it will be published in the proceedings of the Pennsylvania Live Stock Breeders' Association, it is also included in this report by permission of the Secretary of the above named Association. The address is as follows:

RATIONAL FEEDING.

BY MR. EDWARD VAN ALSTYNE, *Denmark, N. Y.*

Mr. Chairman and Friends: If anybody wants to go out, I will not be offended, because I think it is a shame to inflict another speech on this audience when it is nearly ten o'clock, but the Chairman has insisted on my speaking, so I shall have to do so.

I want to lay down three general propositions on the subject of feeding, and a great deal of what I say will be along the foundation which Mr. Fuller laid down this afternoon. Some of you gentlemen have probably found out for yourselves much of what I am going to tell you, but it is those who have not progressed along the line of feeding as they perhaps should have done, that I want to help. If I can, and the others of you will have to bear with me.

Our general purpose in feeding animals is to keep them in good condition. I want to make that emphatic, because from some things I expect to say you may infer that I would underfeed. I want, therefore, to say first of all, that we must keep the animal in good condition. She must be kept so for herself, and for our good.

To illustrate, take the matter of summer feed. If we allow, as we often do, the cow to run down in flesh during the summer, she will never do as well again until she builds up her system once more.

Then, do you believe in adding grain to the pasture? Now, my position on that point is this: I am fully satisfied in my own mind that if we can add our forage crop to the pasture so as to keep her up in flesh and milk, we do not need to feed the grain. But even if in supplementing the pasture we keep up the milk flow, but lose flesh, it is better to feed grain, even if we do not get profit on our grain for the time being.

To illustrate—I speak of my own work, because I am more familiar with it than anyone else's—last year we did not feed grain during the summer, and along about September I noticed that my cows had lost flesh. There was no question about that; then I began to feed grain, and, friends, before the pasture of the next year, I know that I fed twofold more grain than I would have done if I had fed a little grain during the summer.

The next proposition I make is this, that there is a difference between feeding cattle for profit, and feeding them for production. "What," you say, "when you feed for profit, don't you feed for production?" Why, certainly not. Take, for instance, the Pan-American Dairy Tests. The people who had charge of the Holsteins and Ayrshires fed them from sixteen to eighteen pounds of grain every day, in addition to plenty of good silage, and then they pointed with pride to the record of their cows, but at the end of the week, when the cost of their feed was taken from the value of this production, instead of standing at the head, they went down fourth or fifth, and the second week was a repetition of the first. Then they saw they had to do something, so they gradually reduced the grain rations to ten or twelve pounds, and at the end of the third week, they had more profit on less milk and less feed.

I don't know how it is in Pennsylvania, but in New York, since the doctrine of protein has been preached, our folks find that they get more milk for the same amount of feed. In many cases the question with the farmer has only been, "How many cans of milk can I carry away today?" They do not stop to think that they are carrying away the milk and carrying home the feed. When their check comes, the most of it has gone to pay the feed dealer and little left to pay the interest on the mortgage or buy shoes for the babes. They are feeding for production and not for profit.

Now, as to the character of the feed for our animals. Let us then proceed to the subject of the chart:

First, the green feeds, because they are the best with pasture, at the head.

Next, the dry fodders, feeds that are grown on the farms. It seems to me that one of the objects in keeping a dairy cow is to turn some of the raw, crude, cheap material, through the medium of the dairy cow, into the finished product, and for that purpose it seems to me that we should use as much of our home product as possible.

Every farmer knows that the best feed to give his cows to make them produce milk, is pasture grass, and, if you will notice, pasture grass is 80 per cent. water. Now, if you will put that cow into the

stable, she will eat between eighty and one hundred pounds of it, and do very well on that alone, and after you have satisfied yourself on that point, take this same grass and dry it, and where you had a hundred pounds, you have eighteen or twenty-five; now, you will take this same feed and give it to her, with all the water she can drink, what will happen? She will get thin and dry up.

Now, we want that cow to be in a healthy condition in the winter, and if we have not the pasture grass on which she thrives, we can give her some other succulent feed. You will find here a line of green feeds, three-fourths of them water. You will notice, also, that the dried foods, instead of having 75 per cent. water have less than one-fifth, and as the water is decreased, the crude fibre is increased, and instead of 10 per cent. of it, we have over 40 per cent.

In the dried stalks much of the starch and sugar, which in green corn is digestible, are tissueed in woody fibre. So you will find roots which are 90 per cent. water. Any breeder of sheep will tell you that he will get more growth from less grain if he feeds roots.

What about the protein? It is necessary in these days to understand such terms as "protein" and "carbo-hydrates" and "potassium," and other words that were mentioned this afternoon. Well, we have learned to take them in as we have such words as "auto-car" and several more of these terms.

The protein is the element in the feed that makes the lean meat, and the blood. If there is any man who does not understand this, I want to make it clear, if possible. This element in the food will do all this; it will make the lean meat, and the blood, and you can't get it without it. The man who feeds it is building up the bone and muscle, but most of the feeds grown on our farms are deficient in it. Prof. Hayward has told us what he knows about growing the pig, and that he has to have a good deal of protein with his rations.

Now, we have a young heifer, and we expect her to make a success as a cow, so we must give her the material to build up her body and she can't get it out of the starch and sugar in the food.

Then we have the dry corn, and there is where I think the farmer is making a mistake. Perhaps she is within a few months of calving, and we don't expect her to give us much milk, so we do not feed her protein, but put her on coarse feed, and fail to take into consideration the effect it will have in the development of that calf. Take a case of abortion at about seven months; most of them occur about that time, and I believe that many of them are due to the fact that she did not receive the necessary food element to produce the strength necessary to bear that calf. Unless she is properly fed, she will have to take from her own body to develop that calf, and probably fall off in flesh. Now, I would not feed that cow during the last few months of pregnancy the same concentrated foods as when she is in full milk, but I would give her the cooling protein feeds that would give her the strength she needed. I have heard people talk as though there was no benefit in carbo-hydrates. Why, certainly there is; but the point is, we have most of them in our own feeds, and with this in view how can we bring it down so as to benefit us in a practical and economical manner.

What do we feed in the winter, when we have no pasture grass? Well, we have the silage, which is succulent, but deficient in this protein. I value my reputation, but I will stake it on this proposi-

tion: I will undertake to keep my cattle in as good condition on the silage, and get as much milk, as on the dry stalks and two pounds of grain daily in addition. What does that mean? That I am to that extent free from tribute to the grain dealer.

While we are talking of silage, let me finish up. The corn that we feed our dairy cows can be most economically fed in the form of silage, and I am satisfied that the corn is worth as much, pound for pound, in silage, as it is in meal. In my country it costs about one-tenth to husk the corn, and we have to give the miller about one-tenth to grind it for us. There is one-fifth of the value of our crop. Furthermore, I believe if we add so much corn to our silage that our gutters are full of the corn, it is a waste and an injury to the cow.

Now, if we go and eat a big dinner and on it go and eat a big piece of mince pie, see what happens. The same thing happens to the cow. I claim that if we feed our cow more than she can digest, it is a positive injury. I have fed the cows lots of good corn meal that was not necessary, and both the cows and I lost by it. I believe that not more than sixty bushels of corn per acre is as much as we can safely put into silage, when we give the cows all the silage they will eat twice a day. But when we have all the corn we need the silage; it does not pay to add corn to it in feeding. Then what are we going to feed with it? We must give that cow more protein, but where are we going to get it? Perhaps we have the corn stalks, which are high in fibre and heat-forming elements, but not rich in protein. We do not get it in the corn stalks, nor in the silage, nor in the corn meal, and I want to feed all I can of these, because they are grown on the farm, and are cheaper. But they are deficient in protein, so there is a limit to the amount we can feed.

Now, I keep a book, into which I enter, month by month, on one page, the returns of my dairy, and on the opposite page the cost of the feed, and I am much pleased with the results of my dairy until I turn the leaf and add up the cost of the feed, and subtract that from the returns of my dairy; then I don't feel quite so good. Perhaps you do the same, and I want to see whether we cannot learn to keep that cow a little more economically from the stuff that grows on the farm.

Well, then, we will take the clover, nearly three times as high in protein as the corn stalk, and nearly three times as high as timothy. Now, my friend Wing is here from Ohio to preach the doctrine of alfalfa, and I am glad, because there is about eleven pounds of protein to the hundred pounds—nearly twice the amount as in the clover.

Take next the cheaper grades of bran and middlings, which are upon the market. I agree with Mr. Fuller that the standard of bran and middlings has been raised the past few years. If you will cut your hay when the plant is half in bloom, you will get as much value out of it as from the hay that is allowed to reach full maturity, with a pound of grain per day added. I will stake my reputation on that. You see that I am not recommending anything that will cost a big outlay of money on the part of the average farmer.

Now, what next? We take the Canada Pea. I consider it superior to the clover, and next to the alfalfa, as an economical milk producer. About two bushels of peas and one of oats make a good mixture. But when the oat head is forming and peas are in blossom, what

next? Oats. I know of no feed that will put more stamina into cattle than oats will. They will not produce any more milk, but they will stay longer than wheat bran.

What next? Buckwheat middlings; very little fibre, but very rich in protein, and very rich in fat. Where you are making butter in large quantities, it has a tendency to make a soft butter.

Now, we have got through the list of farm products, but we must have more protein; so what shall we do? Usually we shall have to go out and buy. A man said to me sometime ago, "What is your balanced ration?" I said to him, "I have not got any balanced ration." I am going to buy where I can get the greatest amount of food value for my money. I have been a great sticker for wheat feed, and I have said frequently, because I believed it, that a large portion of our rations should be bran or middlings, because it makes bone. I know now that bran and middlings are not necessary for the cow, and how do I know it? I have eliminated it largely from my list for the last two years, and my cows are just as healthy as they were before. When a man asks me over \$20 for bran, and I can for that money get something that has more protein, I tell him to keep his bran and I will keep my money. What about bone material? If the food is deficient in it, feed a couple spoonfulls of bone meal daily. I find that malt sprouts and brewery grains, which are made from barley, will not hurt the cattle in the least; and these by-products of the brewery are cheaper and better than a like amount of the wheat feeds at the same money.

I don't buy the starch by-products and I need more protein, so what am I going to buy? I don't want to buy crude fibre, and if in some of these mixed feeds, when a man comes to buy them, he finds he is feeding—what did the Professor say this afternoon—20 per cent. I think one of them ran up to 50 per cent. of it, and it is not a notion, but, friends, some of these feeds are 60 per cent. fibre. But I must have more protein, and I will buy where I can get the most digestible material for the least amount of money. I don't know what it will be next year, but I know what it is this year, the brewers' grains, and distillers' grains. A carload of brewers' grain contains twice the amount of the protein and fat as bran; it may not be quite as digestible.

Cottonseed meal at \$30 is not dear when we think it has 40 per cent. of protein and 10 per cent. of fat. Of course, we can't feed that in excessive quantities, but a couple of pounds a day may be fed with profit.

I find that I can get as much milk out of a ton of 20 per cent. gluten as I can out of a ton of cottonseed meal, but if I feed the gluten exclusively, my cows will get thin. Then the linseed meal, very rich in protein and very economical. Prof. Fuller told us this afternoon that some of the stock feeds on the market sold as high as \$160 per ton and are composed chiefly of linseed meal at \$32 per ton. I have never seen the man who denied it, but then, they tell you it is mixed with several expensive drugs. Well, if you want to feed it, I will guarantee this to be as good as the drugs they use:

- 100 lbs. linseed meal.
- 5 lbs. powdered charcoal.
- 5 lbs. Epsom salts.
- 5 lbs. common salt.
- 4 lbs. saltpetre (which they call nitrate of potassium, and we don't recognize it).
- 3 lbs. fenugreek.

You can see how very expensive these things are, and I would say that if the animal is well, I would not give her any of them. Well, friends, there is rational feeding. Now, how much will you feed? Why, we will feed all the animal needs to keep her in good condition and in addition to the course of feeds she has, just as much grain as she will pay a profit on. That depends a good deal on the cow and a good deal on what you are getting for the milk. If you are getting four cents for it, you can feed better than on three cents. It is not "How much milk can I carry away," but "How much have I left for myself?" That is, over and above cost. I think it can safely be put down that eight pounds of grain in addition to the silage and good hay is as much as the average herd will pay a profit on for a daily ration.

But, you ask me, will that ration balance? I don't care a hill of beans whether it balances or not. I have quit sitting up nights figuring on that.

I am going to ask the old cow whether that ration was balanced or not. "How?" you will ask. I put my hand on her skin; if that is soft and oily as it is in summer, when she has pasture grass, she is all right, but if it is coarse and rough, then we put in more protein. Then, her droppings I consider a very important indication. If they are too hard, I would feed her more linseed as a laxative, and if they are too soft, some cottonseed meal, and I don't care whether it balances from one to four or from one to seven; it is all right.

And again, there is a difference in the cows. I find that the Holstein will take a wider ration, with less of the heating elements, than the Jersey. Again, I find that it depends upon the way the cow is kept. A cow that is kept very cold needs more heating feed. You go out here on the Pennsylvania Railroad some day when it is very cold, and you will find that the train is losing time, and the conductor will tell you, if you ask him, that it can't get up steam; the trolley car is making its usual time in the same weather because its power engine is under cover.

We want to calculate by weight and not by quart, and first we must feed that cow so as to keep her in good condition; next, we will feed her for profit and not for production. We will give her the succulent silage, then we will follow with the alfalfa; then we will feed her the coarse feeds we have and to give our animals what they need of protein, we will depend on oats, peas, and home grown feeds, and when we need to buy, we will buy where we can get the greatest amount of protein for the least amount of money, because the cow will be the better for it, and then we will feed her as much as she needs to keep her in good condition, and that will be rational feeding.

The CHAIRMAN: As this is a joint meeting of the State Board of Agriculture, Pennsylvania Dairy Union and the Live Stock Breed-

ers' Association, I will now call on Mr. Norton, President of the Livestock Breeders' Association, to take the Chair, and preside over the remaining part of the session.

Mr. Norton thereupon assumed the Chair, and proceeded to carry out the program of the joint meeting as above referred to.

This closes the proceedings of the State Board of Agriculture proper, the remainder of the program being carried out by the Pennsylvania Livestock Breeders' Association and the Pennsylvania Dairy Union, for Proceedings of which address,

E. S. BAYARD,
National Stockman and Farmer, Pittsburg, Pa.
Secretary Livestock Breeders' Association.

or

W. E. PERHAM, Niagara, Pa.,
Secretary Pennsylvania Dairy Union.



Secretary.

